Lloyd's Register

Rules and Regulations for the Classification of Ships, July 2009

Notice No. 6

Effective Date of Latest Amendments:

See page 1

Issue date: February 2010

RULES AND REGULATIONS FOR THE CLASSIFICATION OF SHIPS, *July 2009*

Notice No. 6

This Notice contains amendments within the following Sections of the *Rules and Regulations for the Classification of Ships, July 2009.* The amendments are effective on the dates shown:

Part	***Chapter***	***Section***	***Effective date***
1	2	2	1 July 2010
1	3	1, 4	1 July 2010
3	1	5	1 July 2010
3	2	3	1 July 2010
3	6	7	1 July 2010
3	10	2	1 July 2010
3	13	1, 2, 7	1 July 2010
3	14	Whole Chapter	1 July 2010
3	16	7	1 July 2010
4	1	9	1 July 2010
4	2	1	1 July 2010

It will be noted that the amendments also include corrigenda, which are effective from the date of this Notice.

The *Rules and Regulations for the Classification of Ships, July 2009* are to be read in conjunction with this Notice No. 6. The status of the Rules is now:

Rules for Ships	Effective date:	July 2009
Notice No. 1	Effective dates:	1 January 2010 & Corrigenda
Notice No. 2	Effective dates:	1 January 2010 & Corrigenda
Notice No. 3	Effective dates:	1 January 2010 & Corrigendum
Notice No. 4	Effective dates:	1 January 2010 & Corrigenda
Notice No. 5	Effective dates:	1 July 2010 & Corrigenda
Notice No. 6	Effective dates:	1 July 2010

Part 1, Chapter 2
Classification Regulations

Effective date 1 July 2010

■ *Section 2* Character of classification and class notations

2.2 Character symbols

(*Part only shown*)
2.2.2 A full list of character symbols for which ships may be eligible is as follows:

✠ This distinguishing mark will be assigned, at the time of classing, to new ships constructed under LR's Special Survey, in compliance with the Rules, and to the satisfaction of the Classification Committee.

~~✠~~ ~~This distinguishing mark will be assigned, at the time of classing, to new ships constructed under LR's Special Survey in accordance with plans approved by another recognised classification society.~~

2.4 Class notations (machinery)

(*Part only shown*)
2.4.1 The following class notations are associated with the machinery construction and arrangement, and may be assigned as considered appropriate by the Classification Committee:

✠ **LMC** This notation will be assigned when the propelling and essential auxiliary machinery have been constructed, installed and tested under LR's Special Survey and in accordance with LR's Rules and Regulations.

~~✠~~ ~~**LMC**~~ ~~This notation will be assigned when the propelling and essential auxiliary machinery have been constructed under the survey of a recognised authority in accordance with the Rules and Regulations equivalent to those of LR. In addition, the whole of the machinery will be required to have been installed and tested under LR's Special Survey in accordance with LR's Rules and Regulations.~~

2.7 Descriptive notes

(*Part only shown*)
2.7.3 Where LR's ShipRight procedures for the following have been applied on a voluntary basis, then a descriptive note will, at the Owner's request, be entered in column 6 of the *Register Book*, preceded by the word **ShipRight** (*see also* Pt 3, Ch 16 and Pt 5, Ch 21):

ES	Enhanced Scantlings
PCWBT(date)	Protection Coatings in Water Ballast Tanks
SEA(Hss-n)	Ship Event Analysis (Hull Surveillance Systems)

Part 1, Chapter 3
Periodical Survey Regulations

Effective date 1 July 2010

■ *Section 1* General

1.5 Definitions

1.5.16 ~~**A Corrosion Prevention System** is normally considered a full hard protective coating. This is usually to be an epoxy coating or equivalent. Other systems (e.g. soft coatings) may be considered acceptable as alternatives provided they are applied and properly maintained in compliance with the manufacturer's specification.~~ **A Corrosion Prevention System** is a system designed to prevent or reduce corrosion of metals; such as a coating system, a cathodic protection system or a combination of the above.

1.5.18 **Coating Condition** is defined as follows:
GOOD ~~condition with only minor spot rusting affecting not more than 20 per cent of areas under consideration, e.g. on a deck transverse, side transverse, on the total area of platings and stiffeners on the longitudinal structure between these components, etc.~~
Condition with spot rusting on less than 3 per cent of the area under consideration without visible failure of the coating.
Rusting at edges or welds must be on less than 20 per cent of the edges or weld lines in the area under consideration.

FAIR ~~condition with local breakdown at edges of stiffeners and weld connections and/or light rusting affecting 20 per cent or more of areas under consideration.~~
Condition with breakdown of coating or rust penetration on less than 20 per cent of the area under consideration.
Hard rust scale must be less than 10 per cent of the area under consideration.
Rusting at edges or welds must be on less than 50 per cent of edges or weld lines in the area under consideration.

POOR ~~condition with general breakdown of coating affecting 20 per cent or more of areas under consideration or hard scale affecting 10 per cent or more of area under consideration.~~
Condition with breakdown of coating or rust penetration on more than 20 per cent of the area under consideration.
Hard rust scale on more than 10 per cent of the area under consideration.
Local breakdown concentrated at edges or welds on more than 50 per cent of edges or weld lines in the area under consideration.

■ *Section 4*
Docking Surveys and In-water Surveys – Hull and machinery requirements

4.2 Docking Surveys

4.2.9 Where the antifouling system is changed completely, or partial repair is carried out affecting 25 per cent or more of the antifouling system, the coating specification and antifouling system is to be examined by the Surveyor in accordance with IMO Antifouling System Convention.

Part 3, Chapter 1
General

Effective date 1 July 2010

■ *Section 5*
Information required

5.2 Plans and supporting calculations

5.2.7 Ships that are required to comply with the *Performance Standards for Protective Coatings* of SOLAS Regulation II-1/3-2 and IACS *Common Structural Rules* are to submit information on the coating specification agreed by the shipyard, the ship owner and the manufacturer, including the coating system selection, surface preparation and coating application and inspection procedure.

5.3 Plans to be supplied to the ship

5.3.4 Details of any corrosion prevention systems applied or fitted, are to be placed onboard the ship.

5.3.5 For ships that are required to comply with IMO *Performance Standard for Protective Coatings*, a copy of the Coating Technical File (CTF) is to be kept onboard.

Existing paragraphs 5.3.4 *to* 5.3.8 *have been renumbered* 5.3.6 *to* 5.3.10*.*

Part 3, Chapter 2
Materials

Effective date 1 July 2010

■ *Section 3*
Corrosion protection

3.1 General

3.1.1 Where bimetallic connections are made, measures are to be incorporated to ~~preclude~~ mitigate galvanic corrosion.

~~**3.6 Corrosion protection coatings for salt water ballast spaces**~~

~~*3.6.1* At the time of new construction, all salt water ballast spaces having boundaries formed by the hull envelope shall have an efficient protective coating, epoxy or equivalent, applied in accordance with the manufacturer's recommendations. The durability of the coatings could affect the frequency of survey of the spaces and light coloured coatings would assist in improving the effectiveness of subsequent surveys. It is therefore recommended that these aspects be taken into account by those agreeing the specification for the coatings and their application.~~

~~*3.6.2* For further information and recommendations regarding the coating of salt water ballast spaces see the *List of Paints, Resins, Reinforcements and Associated Materials*, published by LR.~~

3.6 Protective coatings for dedicated sea water ballast tanks of all types of ships and double-side skin spaces of bulk carriers

3.6.1 For ships that are required to comply with IMO Resolution MSC.215(82), *Performance Standards for Protective Coatings*, all dedicated sea water ballast tanks of all types of ships and double-side skin spaces of bulk carriers are to comply with all of the requirements of the Resolution, *see* ShipRight procedure *Anti-Corrosion Systems Notations*.

3.6.2 For ships that are not required to comply with the IMO Resolution MSC.215(82), *Performance Standards for Protective Coatings*, all sea water ballast spaces having boundaries formed by the hull envelope are to have an efficient protective coating, epoxy or equivalent, applied in accordance with the manufacturer's recommendations, *see* ShipRight procedure *Protective Coatings in Water Ballast Tanks (PCWBT)*.

Part 3, Chapter 6
Aft End Structure

Effective date 1 July 2010

■ *Section 7* Sternframes and appendages

7.1 General

7.1.4 Cast sternframes, rudder horns, shaft brackets and solepieces are to be manufactured from special grade material. Cast bossings can be manufactured from normal grade material, *see* Ch 4,2 of the Rules for Materials.

Part 3, Chapter 10
Welding and Structural Details

Effective date 1 July 2010

■ *Section 2* Welding

2.2 Fillet welds

(*Part only shown*)
2.2.7 ~~Continuous~~ Double continuous fillet welding is to be adopted in the following locations, and may be used elsewhere if desired:

(j) Other connections or attachments, where considered necessary, and in particular the attachment of minor fittings to higher tensile steel plating.

~~(k) Fillet welds where higher tensile steel is used.~~

2.2.8 Where intermittent welding is used, the welding is to be made double continuous in way of brackets, lugs and scallops and at the orthogonal connections with other members.

2.2.9 As an alternative to intermittent welding, single sided welding may be used. Only mechanised single sided welding is acceptable although manual single sided welding may be used at non-critical locations e.g. deck house stiffeners. Where single sided welding is used, the welding is to be made double continuous in way of brackets, lugs and scallops and at the orthogonal connections with other members.

Existing paragraph 2.2.8 *has been renumbered* 2.2.10.

2.9 Inspection of welds

2.9.4 The following non-destructive examination is to be carried out on ships to be assigned the class notation '**Chemical tanker**':

(a) All crossings of butts and seams of cargo tank bulkhead plating which are welded in assembly areas or on the berth.
(b) Where cargo tank boundary welding is completed in assembly areas or on the berth, a minimum of 10 per cent of the total weld length is to be crack detected.
(c) Where side and bottom longitudinal framing and longitudinal stiffeners terminate at transverse bulkheads, a minimum of 10 per cent of the bulkhead boundary connections is to be crack detected in addition to the requirement given in (b).
(d) Where longitudinal framing and longitudinal bulkhead stiffeners are continuous through transverse bulkheads, 30 per cent each of the bottom and shipside boundaries and 20 per cent of the longitudinal bulkhead boundaries are to be crack detected in addition to the requirement given in (b).
(e) Where transverse framing members are continuous through the cargo tank boundary, a minimum of 10 per cent of boundary connections is to be crack detected.

Part 3, Chapter 13
Ship Control Systems

Effective date 1 July 2010

■ *Section 1*
General

1.4 Materials

1.4.2 Cast steel stern frames, rudder horns, shaft brackets and sole pieces are to be manufactured from special grade material as specified in Ch 4,2 of the Rules for Materials.

■ *Section 2*
Rudders

2.9 Ancillary items

2.9.1 Internal surfaces of double plate rudders are to be efficiently coated~~, and means for draining the rudder are to be provided~~. Alternatively, where it is intended to fill the rudder with plastic foam or use a corrosion inhibitor, details are to be submitted. Means for draining the rudder are to be provided.

~~2.9.2 Where it is intended to fill the rudder with plastic foam, details of the foam are to be submitted.~~

Existing paragraphs 2.9.3 *to* 2.9.7 *have been renumbered* 2.9.2 *to* 2.9.6.

■ *Section 7*
Equipment

7.1 General

Table 13.7.1 Equipment requirements (*see continuation*)

Ship type	Service	Required equipment
Cargo ships, bulk carriers, tankers, ferries, dredgers, etc. (*see* 1.1.2)	Unrestricted service	(1) *See* Tables 13.7.2 and 13.7.3, using N_C
Ferries	Certain restricted Services, *see* Pt 1, Ch 2,2.3.8	(2) *See* Tables 13.7.2 and 13.7.3, using N_C and N_A as appropriate Mass of bower anchor Chain cable length and diameter } N_A = one grade below N_C Stream anchor may be omitted
Ferries	Specified coastal service, *see* Pt 1, Ch 2,2.3.9	~~(2) See Tables 13.7.2 and 13.7.3, using~~ ~~N_C and N_A as appropriate~~ ~~Mass of bower anchor~~ ~~Chain cable length~~ ~~and diameter~~ } ~~N_A = one grade below N_C~~ ~~Stream anchor may be omitted~~ (3) As per item (2), also Anchor chains: Where L < 30 m, may be replaced with wire ropes of equal minimum breaking strength which should: (a) have a length 1,5 times that for chain cable required by Table 13.7.2 and (b) have a length of Grade U2/U1 chain cable not less than 12,5 m between anchor and wire rope. Where 30 m ≤ L ≤ 40 m one chain cable may be replaced with wire rope meeting the requirements of L > 40 m. The other may be replaced with wire rope meeting the require-ments of L < 30 m. Where 40 m < L ≤ 90 m, both chain cables may be replaced with wire rope of equal minimum breaking strength which should (a) have a length 1,5 times that for chain cable required by Table 13.7.2 and (b) have a minimum mass per unit length of 30% that of Grade U2 chain cable required by Table 13.7.2 and (c) have a length of Grade U2/U1 chain cable not less than 12,5 m between anchor and wire rope.
Dredging and reclamation craft	Extended protected waters service, *see* Pt 1, Ch 2,2.3.7	~~(3)~~ (4) *See* Tables 13.7.2 and 13.7.3, using N_C and N_A as appropriate N_A = N_C reduced by two grades, except for stream anchors, or mooring lines Stream anchor – not required if ship fitted with positioning spuds
	Protected waters service, *see* Pt 1, Ch 2,2.3.6	~~(4)~~ (5) *See* Tables 13.7.2 and 13.7.3 using N_C and N_A as appropriate Mass of bower anchor Chain cable diameter } N_A = 0,5N_C Bower anchors { powered ships – two anchors; unpowered (manned) ships – one anchor Chain cable length – greater of 2L m or 10,0T_D m, but need not exceed requirements for an ordinary cargo ship with anchors of the same mass Mooring lines – as required for N_C Wire ropes – may be substituted for chain cable on bower anchors if breaking strength ≥1,5 times that of the chain cable

Table 13.7.1 Equipment requirements (*continued*)

Ship type	Service	Required equipment
Trawlers, stern trawlers, fishing vessels	Unrestricted service	~~(5)~~ (6) *See* Table 13.7.4, and Notes to Table 13.7.3 using N_C Anchor chains cable: Where L < 30 m, may be replaced with wire ropes of equal strength. Where 30 m ≤ L ≤ 40 m, one chain cable may be replaced with wire rope of equal strength provided normal chain cable maintained for the second line. Wire ropes of trawl winches complying with above may be used as anchor cables. Wire ropes substituted for anchor chains should (a) have a length 1,5 times that for chain required by Table 13.7.4 and (b) have a length Grade U2/U1 of chain not less than 12,5 m between anchor and wire rope. Hawsers and warps – Sufficient in number and strength for proper working of the ship
For symbols, *see* continuation of Table		
Tugs	Unrestricted and restricted service	~~(6)~~ (7) *See* Table 13.7.2 using N_C except as stated below Stream anchor – not required Towlines – adequate for tug's maximum bollard pull with factor of safety ≥ 2,0
	Service restricted, *see* Pt 1, Ch 2,2.3.7 to 2.3.10	~~(7)~~ (8) *See* Table 13.7.2 using N_C Mass of bower anchor, Chain cable diameter } reduced to correspond to two Equipment Letters below that required for N_C Anchor chains As item ~~(2)~~ (3) in this Table
	Protected waters service, *see* Pt 1, Ch 2,2.3.6	~~(8)~~ (9) *See* Table 13.7.2 using N_A Mass of bower anchor, Chain cable diameter } $N_A = 0{,}5N_C$ Chain cable length = 0,5 times length required by N_A Where N_C < 90, the requirements for anchors and chain cable will be specially considered Anchor chains As item ~~(2)~~ (3) in this Table
Offshore supply ships	Unrestricted service	~~(9)~~ (10) *See* Tables 13.7.2 and 13.7.3, using N_C Chain cable length and diameter – increased to correspond to two Equipment Letters above that required for N_C. Need not be applied for ships with **DP(AAA)**, **DP(AA)** or **DP(AM)** notations
Manned barges and pontoons	Service restricted, *see* Pt 1, Ch 2,2.3.7 to 2.3.10	~~(10)~~ (11) As item ~~(3)~~ (4) in this Table

Table 13.7.1 Equipment requirements (*conclusion*)

Ship type	Service	Required equipment
Unmanned barges and pontoons	Unrestricted service, or service restricted, *see* Pt 1, Ch 2,2.3.7 to 2.3.10	~~(11)~~ (12) *See* Tables 13.7.2 and 13.7.3, using N_C and N_A as appropriate Anchors: L < 30 m, no anchor need be carried; $L \geq$ 30 m, one anchor to be fitted Anchor cable length – greater of 40 m or 2L m (a) Unrestricted service: mass of anchors and chain cable diameters as for N_C (b) Protected water service, *see* Pt 1, Ch 2,2.3.6: mass of anchors and chain cable diameters, $N_A = 0{,}5N_C$ (c) Service restriction, *see* Pt 1, Ch 2,2.3.7 to 2.3.10: mass of anchor and chain cable diameter, N_A reduced to correspond to two Equipment Letters below N_C Mooring lines: L < 65 m, two mooring lines to be fitted; $L \geq$ 65 m, three mooring lines to be fitted; length of mooring lines to be the greater of 2L or 80 m, but need not exceed that for manned ships. Strength of each line to be that required by N_C. Consideration will be given to proposals to omit anchoring equipment in association with the assignment of the character figure **1**, *see* Pt 1, Ch 2,2.2. Where L < 65 m consideration will be given to the omission of anchoring and mooring equipment, in which case the character letter **N** will be assigned in the character of classification, *see* Pt 1, Ch 2,2.2
Symbols		
L = length of ship as defined in Ch 1,6.1 N_A = actual equipment number to be used, if different from N_C N_C = calculated equipment number for ship as required by Ch 1,7 T_D = maximum depth at which ship is designed to dredge, in metres		

Part 3, Chapter 14
Cargo Securing Arrangements

Effective date 1 July 2010

■ *Section 1* General

1.1 Application

1.1.1 All cargo ships, regardless of tonnage, except those engaged solely in the carriage of either liquid or solid bulk cargoes are to be provided with a Cargo Securing Manual approved by the Flag Administration, as required by SOLAS 1974 (as amended). Sections 2, 4, 7 (if applicable) and 10 apply to all ships for which a Cargo Securing Manual is required. It is recommended that the container securing arrangements in the Cargo Securing Manual are designed in accordance with Sections 3, 5, 6, 8 and 9. Furthermore, it is recommended that the container securing arrangements should be submitted to Lloyd's Register (hereinafter referred to as LR), for formal approval. In cases where LR is authorised to carry out the approval of the Cargo Securing Manual on behalf of a National Administration and the container securing arrangements have not been designed on the basis of the LR Rules nor received formal LR approval, the Cargo Securing Manual will be annotated accordingly highlighting this fact. In general, Cargo Securing Manuals can be approved by LR if authorised by the National Authority.

~~*1.1.3*~~ *1.1.2* Where container securing arrangements are fitted, and the design and construction of the system are in accordance with this Chapter, the ship will be eligible to be assigned the special features notation **CCSA** (certified container securing arrangements). In addition to the fixed fittings the Initial and Periodical Survey requirements of Section 10 for all loose fittings are applicable. Where loose container securing fittings are supplied for part container stowage only, the special features notation will be suitably modified.

~~*1.1.2*~~ *1.1.3* ~~Where the design and construction of the system comply with Sections 2, 4 and 10, and all the proposed fixed cargo securing fittings have been certified by an organisation acceptable to Lloyd's Register (hereinafter referred to as 'LR'), the ship will be eligible to be assigned the descriptive note **fsa** (fixed securing arrangements) and for an entry to be made in column 6 of the *Register Book*.~~ Where the container securing arrangements have been approved by LR and incorporated into the Cargo Securing Manual, and all proposed loose and fixed cargo securing fittings have been certified by LR or an organisation acceptable to LR, the ship will be eligible to be assigned the descriptive note **CSA** (container securing arrangement) and for an entry to be made in column 6 of the *Register Book*. The Initial and Periodical Survey requirements for loose fittings specified in Section 10 are not applicable.

~~*1.1.4* Where container securing arrangements are fitted and the design and construction of the system are in accordance with this Chapter, but an Initial Survey in accordance with 10.1.1 has not been requested, the descriptive note **fcsa (plans)** will be entered in column 6 of the *Register Book*.~~

1.1.4 Fixed fittings being part of the container lashing equipment or which may affect the strength of the ship's hull are subject to approval on the basis of the requirements of this Chapter. Details of the connection and the supporting ship structure require approval to satisfy the design loads determined in accordance with Section 8 or the safe working load of the fixed fitting, as applicable. Drawings are to be submitted showing details of the fittings, the attachment, the local foundations and information about the intended materials and welding.

1.1.5 The requirements for container securing arrangements have been framed in relation to ISO Standard Series 1 ISO 1496-1:1990 including amendment Nos. 1, 2 and 3 Freight Containers. For previous ISO 1496-1:1984 containers reference should be made to the July 2008 LR Rules. Proposals to consider higher allowable forces in accordance with ISO 1496-1 including amendment No.4, 2006 will be specially considered. Proposals for the securing of other types of containers will be specially considered.

1.1.6 I~~n general, the containers are to be assumed loaded to their maximum operating gross weight. Where, however, specified loading patterns are proposed, the securing arrangements may be considered on the basis of~~ Containers are to be loaded so as not to exceed the weights and distribution within the stack according to the cargo securing manual. The ~~these~~ permissible loading patterns ~~which~~ are to be clearly indicated on the container securing ~~approved~~ arrangement plan carried on board the ship.

1.1.8 Where it is intended and specified that loose or fixed parts of the container securing system are used for lifting appliance purposes, e.g. pedestal sockets and fittings used for lifting of hatch covers, or twistlocks used for vertical tandem lifting, the requirements of LR's *Code for Lifting Appliances in a Marine Environment* are applicable. If no approval from lifting aspects is sought, the devices will be considered as part of a container securing arrangement only.

1.1.9 The advantage of having an on-board lashing program to calculate forces acting on the stowage arrangement is highlighted. It is recommended that all ships carrying containers on a regular basis are equipped with such a tool. This may be an extension to the loading instrument covered under Ch 4,8.3. It is recommended that the program is approved by LR. If the software to carry out lashing calculations is approved by LR, the ship will be eligible to be assigned the descriptive note **LI (lash)** and for an entry to be made in column 6 of the *Register Book*.

1.1.10 Forward of $0,25L_{pp}$ aft of the fore perpendicular, it is recommended that all door ends should face aft in order to improve the performance of the container walls to withstand green sea loads.

1.1.11 Improper ship handling related to course and speed or threshold phenomena like parametric rolling can create adverse forces acting on the ship and the cargo which are in excess of the forces determined on the basis of Section 8. It is the responsibility of the master to apply good seamanship in order to mitigate excessive ship motions to reduce forces acting on the cargo stowage arrangements.

1.2 Plans and information to be submitted

1.2.2 For container securing arrangements, the following plans and information are to be submitted:

(a) General arrangement plan showing the disposition and design weights of the containers.
(b) Details of materials, design, scantlings of cell guides structure, lashing bridges, pedestals, and other container securing arrangements, where fitted.
(c) Details of certification, including safe working ~~loads~~ load (SWL), of fixed and loose container securing fittings.
(d) Plans of structure in way of fixed container securing fittings and arrangements.
(e) Design values of the following ship parameters for the container load departure and arrival conditions:
    Moulded draught (T_c)
    Longitudinal centre of flotation (LCF). If this information is not available, for initial design purposes the longitudinal centre of flotation is to be assumed at $0,45L_{pp}$ forward of the aft perpendicular.
    Transverse metacentric height (GM)
(f) Design wind speed (V_W).
(g) Where available, details of the long term distribution of ship motions, particularly roll, pitch and heave, in irregular seas which the ship will encounter during its operating life. Where simplified dynamic response data, or other means of assessing the maximum motions of the ship, are proposed they are to be submitted for consideration. In other cases the motions defined in Section 8 will be used.
(h) The lashing calculations in the cargo securing manual are to be based on two design GM values. The lower design value is to be taken as 2,5 per cent of the breadth *B*, and the upper design value is to be taken as 7,5 per cent *B*. In addition to these two design GM values, actual GM values of the ship in the container loaded condition from the approved trim and stability booklet may be included, if available.

1.2.3 Where containers of types other than ISO containers are to be incorporated in the stowage arrangement, the ~~container stowage plan~~ cargo securing manual is to indicate clearly the locations where these containers are stowed. The ~~plan~~ manual is also to indicate the container weights and required securing arrangements for stacks composed entirely of ISO standard containers.

1.4 Symbols and definitions

1.4.1 The following definitions are applicable to this Chapter, except where otherwise stated:

a = breadth of the container, in metres
b = length of the container, in metres
e = base of natural logarithms, 2,7183
GM = transverse metacentric height of the ship ~~in the container load condition, in metres. It is recommended that for the purpose of design of the container securing system, *GM* should be taken as not less than 0,05*B* m~~.

x = longitudinal horizontal distance from O_m to the centre of the container, in metres
y = transverse horizontal distance from the centreline of the ship to the centre of the container, in metres
z_m = vertical distance from O_m to the centre of gravity of the container, in metres
KG = vertical distance of the centre of gravity of the ship, above the keel, in metres
A = projected side area of the container, in m^2
B = moulded breadth of the ship, in metres
D = moulded depth of the ship, in metres
L_{pp} = length between perpendiculars of the ship, in metres
O_m = centre of motion, to be taken on the centreline at the longitudinal centre of flotation of the ship and at a distance ~~T_c or $D/2$, whichever is the greater,~~ $2T_c/3 + KG/3$ above the keel, but not less than the greater of T_c and $D/2$
R = the rating, or maximum operating gross weight for which the container is certified, and is equal to the tare weight plus payload of the container, in tonnes
T_c = moulded draught in the container load condition, in metres
T_h = full period of heave of the ship, in seconds
T_p = full period of pitch of the ship, in seconds
T_r = full period of roll of the ship, in seconds
V_w = wind speed, in m/s. For ships with an unrestricted worldwide service area notation a wind speed of 40 m/s is to be applied
W = design weight of the container and contents, in tonnes. In general W is to be taken as R unless reduced maximum weights are specified. The following minimum weights W are to be used:

20 ft container	2,5 tonnes
40 ft container	3,5 tonnes
45 ft container	4,0 tonnes
48 ft and 53 ft container	4,5 tonnes

ϕ = maximum single amplitude of roll, in degrees
ψ = maximum single amplitude of pitch, in degrees~~.~~
g = acceleration due to gravity and is to be taken as 9,81 m/s^2.

■ Section 2
Fixed cargo securing fittings, materials and testing

2.3 Prototype testing

Table 14.2.2 Test loads and test modes for fixed container securing fittings
(*Part only shown*)

Item No.	Description	Recommended minimum, in ~~tonnes~~ kN		
		SWL	Proof load	Breaking load
1	Flush socket	~~20~~ 250	~~30~~ 375	~~40~~ 500
2	Pedestal socket	~~20~~ 250	~~30~~ 375	~~40~~ 500
		~~15~~ 200	~~22,5~~ 300	~~30~~ 400
3	'D' ring	~~18~~ 250	~~27~~ 375	~~36~~ 500
4	Lashing plate	~~18~~ 250	~~27~~ 375	~~36~~ 500

NOTES
1. For items 3 and 4, where specially designed for use with chain or steel wire rope (SWR) lashings, a lesser SWL may be considered. ~~A greater SWL will be required for use with item 2 in Table 14.3.2.~~
2. For items 1 and 2, where multiple flush sockets or pedestal sockets are involved, test loads are to be applied simultaneously to each socket opening which can be loaded simultaneously in service.
3. For item 4, where multiple lashing points are fitted in one deck plate fitting, testing is to be similarly arranged as for Note 2.
4. Where containers with strength higher than required for ISO containers are used, consideration will be given to the required minimum loads.
5. The test modes illustrated above are diagrammatic only.

2.4 Production testing

(*Part only shown*)

2.4.1 The nature and extent of proposed production testing will be considered by LR, but the arrangements are to be at least equivalent to one of the following testing procedures:

(b) All fittings are to be ~~proof~~ loaded to the SWL of the item.

2.4.3 Permanent deformation (other than that due to initial embedding of component parts) will not be accepted unless tests are conducted in accordance with 2.4.1(a) and the SWL of the sample is ~~25 tonnes~~ 250 kN or greater. In this case, consideration may be given to acceptance of permanent deformation in the load range between SWL + ~~12,5 tonnes~~ 125 kN and the proof load, provided that satisfactory manual operation can be achieved after completion of tests.

Table 14.2.1 Design breaking loads and proof loads for fixed cargo securing fittings

Minimum design breaking load		Minimum proof load	
SWL ≤ ~~40 tonnes~~ 400 kN	SWL > ~~40 tonnes~~ 400 kN	SWL ≤ ~~40 tonnes~~ 400 kN	SWL > ~~40 tonnes~~ 400 kN
2 x SWL	SWL + ~~40 tonnes~~ 400 kN	1,5 x SWL	SWL + ~~20 tonnes~~ 200 kN

NOTE
Breaking and proof loads for fixed cargo securing fittings of a material other than steel will be specially considered.

■ *Section 3* Loose container securing fittings, materials and testing

3.1 General

3.1.4 In the following, the term 'Fully automatic fitting' is used to describe fittings which do not require manual operation during unloading of the containers. It should be noted that usually these fittings do not mechanically secure the container in the vertical direction (perpendicular to the hatch cover) in the upright condition when subject to pure vertical motions. Other modes of operation and novel design will be specially considered.

3.2 Materials and design

3.2.4 Locking devices and other fittings which are inserted into the container castings on the quayside before lifting on board are to be such as to minimise the risk of working loose under the effects of vibration and the risk of falling out.

3.2.5 For twistlocks, bottom twistlocks, midlocks, stackers with intermediate plates and fully automatic fittings the contact areas, for both tension and compression between the fitting and the corner castings of the containers, are to be such as not to exceed a bearing stress of 300 N/mm^2 under the safe working load of the fitting. No increase in the permissible stress level will be given due to higher strength material of the fittings. In case the design is such that the contact area is sloped or inclined and not parallel to the container corner casting, the effective contact area will be specially considered.

3.3 Prototype testing

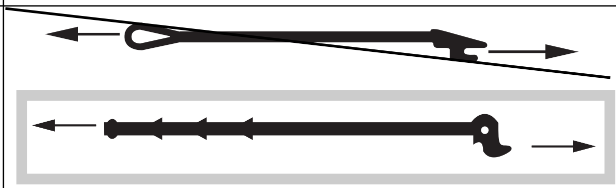
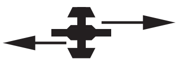
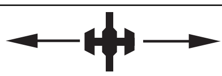
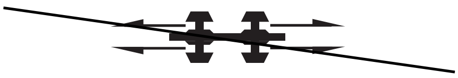
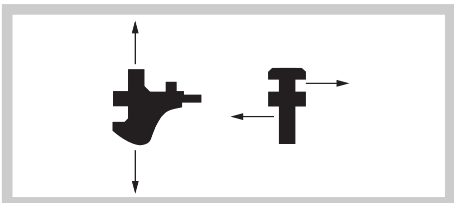
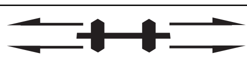
3.3.1 Prototype tests are to be in accordance with 2.3.1 to 2.3.6, except that Tables 14.3.1 and 14.3.2 are to be applied in lieu of Tables 14.2.1 and 14.2.2 respectively. For vertical lasing, *see* 5.4.7 (b).

Table 14.3.1 Design breaking loads and proof loads for loose container securing fittings

Item	Min. design breaking load		Min. proof load	
	SWL ≤ ~~40 tonnes~~ 400 kN	SWL > ~~40 tonnes~~ 400 kN	SWL ≤ ~~40 tonnes~~ 400 kN	SWL > ~~40 tonnes~~ 400 kN
Lashings				
Wire rope	3 x SWL			
Rod: higher tensile steel	2 x SWL		1,5 SWL	
Chain: mild steel	3 x SWL			
higher tensile steel	2,5 x SWL			
Other loose container securing fittings	2 x SWL	SWL + ~~40 t~~ 400 kN	1,5 x SWL	SWL + ~~20 t~~ 200 kN

NOTES
1. Higher tensile steel is defined for this purpose as steel having a yield stress not less than 315 N/mm^2 ~~(32 kgf/mm²)~~.
2. Breaking and proof loads for lashings of material other than steel will be considered.

Table 14.3.2 Test loads and test modes for loose container securing fittings

Item No.	Description	Required test modes	Recommended minimum, in ~~tonnes~~ kN SWL	Proof load	Breaking load
1	Lashing rod (HTS)		~~18~~ 180	~~27~~ 270	~~36~~ 360
2	Lashing rod ~~(high strength)~~	 ~~Tensile load~~	~~25~~ 250	~~37,5~~ 375	~~50~~ 500
3	Lashing chain (HTS)		~~8~~ 80	—	~~20~~ 200
4	Lashing chain (M.S.)		~~10~~ 100	—	~~30~~ 300
5	Lashing steel wire rope		~~12~~ 120	—	~~36~~ 360
6	Turnbuckle	 Tensile load 	~~18~~ 250	~~27~~ 375	~~36~~ 500
7	Twistlock ~~(single)~~ (manual, semi-automatic and fully automatic fittings)	 Shear load	~~15~~ 200	~~22,5~~ 300	~~30~~ 400
		 Tensile load	~~20~~ 250	~~30~~ 375	~~40~~ 500
8	~~Twistlock (double)~~ Midlock	 ~~As for item 7 + Tensile load~~ Shear load	~~5~~ 200	~~7,5~~ 300	~~10~~ 400
		 Tensile load	250	375	500
9	Stacker ~~(single)~~	 Shear load	~~15~~ 200	~~22,5~~ 300	~~30~~ 400
~~10~~	~~Stacker (double)~~	 ~~As for item 9 + Tensile load~~	~~5~~	~~7,5~~	~~10~~
~~11~~	~~Penguin hook~~	 ~~Tangential load~~	~~18~~	~~27~~	~~36~~
~~12~~	~~Bridge fitting~~	 ~~Tensile load~~	~~5~~	~~7,5~~	~~10~~
~~13~~	~~Buttress~~	 ~~Tensile load~~	~~See Note 3~~		

NOTES
~~1. For items 6 and 11, where specially designed for use with chain or SWR lashings, a lesser SWL may be considered.~~
~~2. For items 8, 10 and 12, the recommended minimum loads quoted in the Table refer to the fittings when employed in a location in container stacks which do not transfer load to an adjacent stack. Where items 8, 10 and 12 are fitted in line with a buttress/shore support at stowage sides, then test loads are to be determined in association with Note 3.~~
~~3. For item 13, test loads for buttress fittings are to be determined by detailed consideration of the individual stowage arrangement proposed in association with Table 14.3.1.~~
~~4.~~ 1. Where containers with strength higher than required for ISO containers are used, special consideration will be given to the required minimum loads.
~~5.~~ 2. The test modes illustrated above are diagrammatic only.
~~6. HTS denotes high tensile steel.~~
3. Other fittings not covered in this Table may be specially considered, *see also* 3.5.1.

3.4 Production testing

3.4.2 Permanent deformation (other than that due to initial embedding of component parts) will not be accepted unless tests are conducted in accordance with 3.4.1(a)(i) and the SWL of the sample is ~~25 tonnes~~ 250 kN or greater. In this case, consideration may be given to acceptance of permanent deformation in the load range between SWL + ~~12,5 tonnes~~ 125 kN and the proof load, provided that satisfactory manual operation can be achieved after completion of tests.

3.5 Function and environmental testing

3.5.1 For fittings of novel design or with special features, in addition to the prototype and production testing, a function test may be required to demonstrate that the fitting is fit for purpose. Details of the function test will be considered on an individual basis taking into consideration the mode of operation of the fitting. In addition, LR reserves the right to require environmental tests. The actual test depends on the individual design of the fitting. The tests are to verify that environmental and ageing effects, such as corrosion, icing, debris contamination, etc., do not impinge on the safe operation of the fitting. In this case LR reserves the right to require the submission of maintenance instructions as part of the approval procedure.

■ *Section 4*
Ship structure

4.1 General

4.1.1 The ship structure and hatch covers in way of fixed cargo securing fittings are to be strengthened as necessary, *see* 1.1.7.

4.1.2 The fitting of a breakwater may be required, *see* 8.1.8.

4.2 Strength

4.2.4 Stresses induced in the weld attachments, supporting structure, cell guides, lashing bridges and other structures serving as fixed cargo securing points, determined using the design loads ~~from~~ as defined in 4.2.1 to 4.2.3, are not to exceed the permissible values given in Table 14.4.1.

Table 14.4.1 Permissible stress values

	Permissible stress, N/mm^2 ~~(kgf/mm^2)~~
Normal stress (bending, tension, compression)	$0{,}67\sigma_o$
Shear stress	$0{,}4\sigma_o$
Combined stress	$0{,}86\sigma_o$
Symbols	
σ_o = specified minimum yield stress, in N/mm^2 ~~(kgf/mm^2)~~	

■ *Section 5*
Container securing arrangements for stowage on exposed decks without cell guides

5.1 General

5.1.3 Where containers are stowed on hatch covers, the covers are to be effectively restrained against sliding by approved type stoppers or equivalent. Details of the locations of stoppers relative to the supporting structure are to be submitted at ~~as~~ an early a stage ~~as possible~~.

5.1.5 In the region forward of $0{,}25L_{pp}$ abaft the fore perpendicular additional securing devices may be required, *see* ~~8.1.8~~ 8.1.9.

5.1.6 In general, stowage of heavy containers on top of lighter containers is to be avoided, unless validated as being satisfactory by an approved on-board lashing program or covered by the approved container securing arrangement.

5.1.7 Regarding the use of fully automatic fittings the following requirements apply:

(a) For fittings where the locking method requires defined clearances between the corner castings and the fixed foundations, such fittings are not to be used at the lowest tier of a stack which is resting with one side on a hatch cover panel and bridging to a container stanchion. The same applies if the stack is resting on different hatch cover panels or foundations where relative deflection during ship operation can occur.

(b) If the lashing system consists of a combination of fully automatic fittings with lashing rods, only internal cross lashings are to be used. No external lashings or vertical lashings are to be applied, unless the clearance of the loose securing fitting under safe working loads is insignificantly small. Alternative arrangements will be specially considered taking into consideration the clearances of the fittings.

5.4 Containers in more than two tiers

5.4.3 When lashings are employed, they are to be fitted to the bottom corner casting of the upper container and not to the top casting of the container below.

~~5.4.3~~ 5.4.4 Proposals to use lashings in pairs (para-lash arrangements) will be considered. Lashings in pairs are ~~generally~~ to be attached one to the bottom corner fitting of the upper tier and the other to the top corner fitting of the lower tier container. Suitable connections are to be provided at the lower ends. The effectiveness of paired lashings is to be taken as equal to 1,5 times that of a single lashing~~, unless a suitable load-equalising device is fitted~~.

~~5.4.4~~ 5.4.5 Where ~~a fourth tier of containers is~~ tiers are fitted at higher levels, ~~it is generally~~ they are to be secured ~~to the third tier~~ by locking devices at each corner and each tier.

~~*5.4.5* Proposals to stow more than four tiers will be specially considered.~~

5.4.6 Proposals to use horizontal lashings connected to lashing bridges will be specially considered. The forces in such securing systems are to be determined by direct calculations taking into account the following effects:

- stiffness of the container walls, the lashings and the lashing bridge; and
- the possible horizontal displacements of the containers relative to the lashing bridge due to the clearances of the hatch cover stoppers and the container securing fittings.

5.4.7 When vertical lashings are used in combination with container securing fittings, consideration is to be given to the vertical clearances between the fittings and the container corner castings.

(a) The lashing assembly is to remain elastic when subject to an elongation equating to the number of interface fittings fitted below the point where the vertical lashing is applied to the stack. In order to avoid overstressing of the rod and the turnbuckle, provision of spring or elastic elements incorporated into the turnbuckle may be advantageous. When lashing from lashing bridge level, the number of interfaces is to be counted down to the level where the lowest container is resting. The lashing rod is to be fitted to the bottom casting of the container. For container securing fittings having design clearances in accordance with ISO 3874, a nominal clearance per fitting of 10 mm is to be taken to determine the total elongation of the lashing system. For fittings having clearances in excess of 10 mm, the total elongation is to be calculated taking into consideration the higher clearances.

(b) A prototype test is to be carried out to demonstrate that the vertical lashing has a safe working load of 150 kN when elongated up to the calculated total design clearance plus 10 per cent without plastic deformation.

(c) To take into account the load bearing effect of the vertical lashing arrangement when performing lashing calculations, the permissible calculated lifting force can be increased by 150 kN in addition to the safe working load of the container securing fitting. The nominal lifting force is not to exceed 400 kN at the securing fittings below the fitting position of the vertical lashing.

5.4.8 For stowage arrangements incorporating fully automatic fittings which do not mechanically secure the container in pure vertical direction when subject to vertical motions, it is to be ensured that no separation occurs under the load case specified in 8.2.3(b). In addition, where exposed stacks are secured with fully automatic fittings without internal cross lashings, provision is to be made to prevent buoyancy forces acting on the container which could disengage the containers. In this case the use of effective side screens is required. Otherwise, the first tier of containers is to be secured by manual or semi-automatic twistlocks.

5.4.9 If the carriage of one or more tiers of 20 ft containers being overstowed with at least one tier of 40 ft containers, so called 'Russian Stow Arrangement' is desired, the following requirements apply.

(a) At the 20 ft gap the containers are to be secured by means of midlocks, whereas the fore and aft ends are to be secured by twistlocks and if necessary supplemented by lashing rods.

(b) The 40 ft overstow container is to be secured by twistlocks or if necessary with a combination of twistlocks and lashing rods. The stack is to be assessed in a two step procedure as follows:
   (i) For location at the 40 ft ends the entire mixed stack is to be considered as a 40 ft stack. The weights of the 40 ft containers are to be considered in the calculations. For the tiers of 20 ft containers, the weight of one 20 ft container is to be taken as the basis for the calculation at each tier.
   (ii) For the location of the 20 ft tiers at the mid bay position the assessment is to be carried out as for an unlashed stack. The 40 ft overstow container does not need to be taken into consideration.

5.5 Line Load stowage

(*Part only shown*)

5.5.1 Where the containers are supported on bearers placed to distribute the stackweight as ~~uniform~~ Line Loads, the following requirements are to be complied with:

(a) The stack is, in general, to comprise a maximum of two tiers of loaded containers.

(b) The load from the upper tier is to be transferred through the container corners. Line ~~Loading~~ loading is not to be used between tiers.

■ *Section 6* Container securing arrangements for underdeck stowage without cell guides

6.1 General

6.1.1 Containers are generally to be stowed in holds ~~and 'tween decks~~ in the fore and aft direction, but alternative arrangements will be considered. The securing arrangements are to be designed on the basis of the most severe distribution of loads which may arise in the container stack.

6.1.11 Attention is drawn to the safety at work aspects for fittings which require operation on top of containers, e.g. double stacking cones, bridge fittings, buttresses and shores. Where these fittings are used, fall protection is to be provided.

■ *Section 7* Container securing arrangements for stowage using cell guides

7.2 Arrangement and construction

7.2.3 Intermediate brackets are to be fitted to vertical cell guides at suitable intervals~~, see Fig. 14.7.1~~.

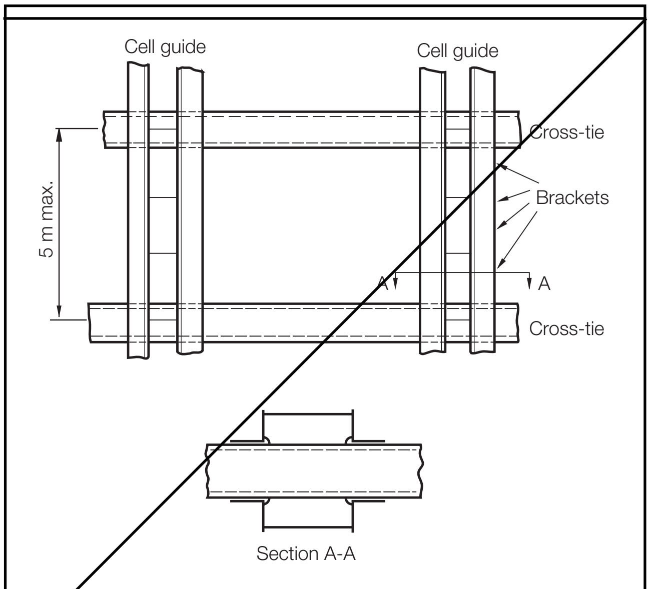


Fig. 14.7.1 Typical arrangement of cell guides

7.2.5 Athwartship cross-ties are to be fitted between cell guides at a spacing determined from the loading on the guides but, generally, not more than ~~5 m~~ 3,0 m apart. Wherever possible, cross-ties are to be arranged in line with the corners of the containers as stowed and are to be supported against fore and aft movement at a minimum of two points across the breadth of the hold. Where, however, the maximum fore and aft deflection in the cross-tie can be shown not to exceed 20 mm, then one support point may be accepted.

7.2.8 If the carriage of 45 ft Euro containers complying with EU Directive 96/53 is specified to be carried in 45 ft cell guides, attention is to be paid with regard to the arrangement of the corner castings, *see* Fig. 14.7.1. The guide bars need to be increased in order to ensure that a minimum design overlap a of 20 mm is achieved taking into account the design clearances and tolerances defined in 7.2.4. Consideration is to be given to the torsional loads being applied to the guide bars.

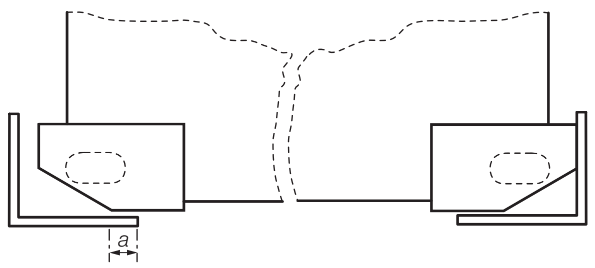


Fig. 14.7.1 45 ft euro container in cell guides

7.3 ~~Mixed stacks of 20 ft and 40 ft containers~~
Carriage of 20 ft containers in 40 ft cell guides in holds

7.3.3 Where it is desired to stow 20 ft containers ~~in the lower tiers~~ without external support at the mid-bay location with or without 40 ft overstow, so called ‘mixed stowage’, arrangements meeting the following requirements ~~will be considered~~ are applicable:

(a) Maximum homogeneous container weights for 20 ft containers stowed in cell guides with no 40 ft container overstowed, can be derived from Tables 14.7.1 and ~~14.7.3~~ 14.7.2 depending on the transverse acceleration and the number of tiers in the stack.

(b) Maximum homogeneous container weights for 20 ft containers stowed in cell guides with at least one 40 ft container overstowed, can be derived from ~~Tables 14.7.2 and 14.7.4~~ Table 14.7.3 depending on the transverse acceleration and the number of tiers in the stack.

(c) ~~Where a mixed stack not covered by Tables 14.7.1 to 14.7.4 is proposed, two thirds of the transverse components of forces acting on 20 ft containers are to be assumed to be transmitted to the cell guides and one third transmitted as a racking force through the unsupported end wall. The container weights are to be such that the racking force on the container end walls does not exceed 15 tonnes at the mid-hold end of the stack of 20ft containers.~~
~~The allowable compressive forces in the container corner posts are not to be exceeded, taking due account of 40 ft containers above as per 7.3.3(e), if applicable. The container weights are to be defined to ensure separation is minimised.~~ Tables 14.7.1 to 14.7.3 have been derived on the basis of all containers in a stack having the same homogeneous weight. Where it is intended to carry non-homogeneous mixed stowage stacks, heavier containers than the table values stated in Tables 14.7.1 to 14.7.3 can be loaded in the lower tiers provided that the total stack weight derived from the tables will not be exceeded. Furthermore, no container having a weight in excess of the maximum weight stated in the tables is to be stowed on top of a lighter container. However, the total accumulated stack weight derived from the above-mentioned tables may be increased by loading the lowest container in the stack up to its maximum rated weight.

(d) Means are to be provided to prevent transverse sliding of the bottom of the stacks of 20 ft containers at the mid~~-hold end~~ bay position. This is to be in the form of permanently attached chocks at the inner bottom or equivalent. The design clearance is to be the same as for the cell guides and in accordance with 7.2.4.

(e) Stacking cones are to be fitted at each corner between ~~each~~ tiers of the 20 ft containers to prevent transverse and longitudinal sliding. In addition, where a 40 ft container is required to be stowed above 20 ft containers, stacking cones are to be fitted at the ends of the 40 ft container between the 40 ft container and the 20 ft containers below.

(f) The 20 ft containers are to have closed steel walls and top (no open frame containers, e.g. tank or bulk containers) ~~and are to be of specially strengthened design, where necessary, to correspond to the vertical compressive load at the cell guide end of the 40 ft containers above~~.

(g) ~~Where fore and aft tension/pressure approved adaptor cones are used to link two 20 ft containers to equate to a 40 ft container, the storage of 40 ft containers above is not required. Special consideration is to be given to the maximum stack weight which is stowed in association with this method of securing. In general, each stack of 20 ft containers is not to exceed 120 tonnes.~~ The orientation of the containers is to be such that all front ends or door ends are facing in one direction.

(h) Cones are to be fitted on the inner bottom in way of the cell guides to restrain container movement in the longitudinal direction.

(j) The containers are to be stowed in the hold in block stowage. In general, free standing stacks due to adjacent empty stacks are to be avoided.

Proposals for stowage arrangements other than the above will be individually considered and are to be accompanied by supporting calculations.

~~Table 14.7.1 Maximum container weights of ISO 1496-1:1984 20 ft containers stowed in 40 ft cell guides with no overstow~~

Lowest tier Transverse acceleration (g)	Maximum container weights, in tonnes					
	3 Tiers	4 Tiers	5 Tiers	6 Tiers	7 Tiers	8 Tiers
0,4	24,0	23,5	18,9	14,3	11,0	8,9
0,405	24,0	23,4	18,7	14,2	11,0	8,8
0,41	24,0	23,2	18,5	14,1	10,9	8,8
0,415	24,0	23,0	18,3	14,0	10,8	8,7
0,42	24,0	22,8	18,2	13,9	10,7	8,7
0,425	24,0	22,6	18,0	13,8	10,7	8,6
0,43	24,0	22,4	17,8	13,7	10,6	8,5
0,435	24,0	22,2	17,6	13,6	10,5	8,5
0,44	24,0	22,0	17,5	13,6	10,5	8,4
0,445	24,0	21,8	17,3	13,5	10,4	8,3
0,45	24,0	21,6	17,1	13,4	10,3	8,3
0,455	24,0	21,4	16,9	13,3	10,3	8,2
0,46	24,0	21,2	16,8	13,2	10,2	8,2
0,465	24,0	21,0	16,6	13,1	10,1	8,1
0,47	24,0	20,8	16,4	13,0	10,1	8,0
0,475	24,0	20,6	16,2	12,9	10,0	8,0
0,48	24,0	20,4	16,1	12,8	9,9	7,9
0,485	24,0	20,2	15,9	12,7	9,9	7,8
0,49	24,0	20,0	15,7	12,6	9,8	7,8
0,495	24,0	19,8	15,5	12,5	9,7	7,7
0,5	24,0	19,6	15,4	12,4	9,7	7,7
0,505	24,0	19,4	15,2	12,3	9,6	7,6
0,51	24,0	19,2	15,0	12,3	9,5	7,5
0,515	24,0	19,0	14,9	12,1	9,4	7,5
0,52	24,0	18,8	14,7	12,0	9,4	7,4
0,525	24,0	18,6	14,5	11,8	9,3	7,4
0,53	24,0	18,4	14,3	11,7	9,2	7,3
0,535	24,0	18,2	14,2	11,5	9,2	7,2
0,54	24,0	18,0	14,0	11,4	9,1	7,2
0,545	24,0	17,8	13,8	11,2	9,0	7,1
0,55	24,0	17,6	13,6	11,1	9,0	7,0

7.4 Cell guide systems on exposed decks

~~**Table 14.7.2 Maximum container weights of ISO 1496-1:1984 20 ft containers stowed in 40 ft cell guides with overstow**~~

Lowest tier Transverse acceleration (g)	Maximum container weights, in tonnes, *see* Note					
	3 Tiers	4 Tiers	5 Tiers	6 Tiers	7 Tiers	8 Tiers
0,4	24,0	24,0	24,0	19,4	16,5	13,7
0,405	24,0	24,0	23,6	19,3	16,4	13,7
0,41	24,0	24,0	23,3	19,1	16,3	13,6
0,415	24,0	24,0	22,9	19,0	16,2	13,5
0,42	24,0	24,0	22,5	18,8	16,1	13,5
0,425	24,0	24,0	22,1	18,7	15,9	13,4
0,43	24,0	24,0	21,8	18,5	15,8	13,3
0,435	24,0	24,0	21,5	18,4	15,7	13,2
0,44	24,0	24,0	21,2	18,2	15,6	13,2
0,445	24,0	24,0	21,0	18,0	15,5	13,1
0,45	24,0	24,0	20,8	17,9	15,4	13,0
0,455	24,0	24,0	20,6	17,7	15,2	13,0
0,46	24,0	24,0	20,5	17,6	15,1	12,9
0,465	24,0	24,0	20,3	17,4	15,0	12,8
0,47	24,0	24,0	20,2	17,3	14,9	12,8
0,475	24,0	24,0	20,1	17,1	14,8	12,7
0,48	24,0	23,9	19,9	17,0	14,7	12,6
0,485	24,0	23,8	19,8	16,8	14,5	12,6
0,49	24,0	23,6	19,6	16,7	14,4	12,5
0,495	24,0	23,4	19,4	16,5	14,3	12,4
0,5	24,0	23,2	19,3	16,4	14,2	12,4
0,505	24,0	23,1	19,1	16,2	14,1	12,3
0,51	24,0	22,9	18,9	16,1	13,9	12,2
0,515	24,0	22,7	18,8	15,9	13,8	12,1
0,52	24,0	22,5	18,6	15,7	13,6	12,0
0,525	24,0	22,4	18,5	15,6	13,5	11,8
0,53	24,0	22,3	18,3	15,4	13,3	11,7
0,535	24,0	22,2	18,2	15,3	13,2	11,6
0,54	24,0	22,1	18,1	15,1	13,0	11,4
0,545	24,0	22,0	18,0	15,0	12,9	11,3
0,55	24,0	21,8	17,9	14,8	12,8	11,2

NOTE
40 ft overstow containers not included in the number of tiers.

7.5 Entry guide devices

~~Table 14.7.3 Maximum container weights of ISO 1496-1:1990 20 ft containers stowed in 40 ft cell guides with no overstow~~

Lowest tier Transverse acceleration (g)	Maximum container weights, in tonnes					
	3 Tiers	4 Tiers	5 Tiers	6 Tiers	7 Tiers	8 Tiers
0,4	24,0	23,5	18,9	15,6	13,4	11,6
0,405	24,0	23,4	18,7	15,5	13,2	11,5
0,41	24,0	23,2	18,5	15,3	13,1	11,4
0,415	24,0	23,0	18,3	15,2	12,9	11,3
0,42	24,0	22,8	18,2	15,0	12,8	11,1
0,425	24,0	22,6	18,0	14,9	12,7	11,0
0,43	24,0	22,4	17,8	14,7	12,5	10,9
0,435	24,0	22,2	17,6	14,6	12,4	10,8
0,44	24,0	22,0	17,5	14,4	12,3	10,6
0,445	24,0	21,8	17,3	14,3	12,1	10,5
0,45	24,0	21,6	17,1	14,1	12,0	10,4
0,455	24,0	21,4	16,9	14,0	11,8	10,2
0,46	24,0	21,2	16,8	13,8	11,7	10,1
0,465	24,0	21,0	16,6	13,7	11,6	10,0
0,47	24,0	20,8	16,4	13,5	11,4	9,9
0,475	24,0	20,6	16,2	13,4	11,3	9,7
0,48	24,0	20,4	16,1	13,2	11,2	9,6
0,485	24,0	20,2	15,9	13,1	11,0	9,5
0,49	24,0	20,0	15,7	12,9	10,9	9,4
0,495	24,0	19,8	15,5	12,7	10,8	9,2
0,5	24,0	19,6	15,4	12,6	10,6	9,1
0,505	24,0	19,4	15,2	12,4	10,5	9,0
0,51	24,0	19,2	15,0	12,3	10,3	8,8
0,515	24,0	19,0	14,9	12,1	10,2	8,7
0,52	24,0	18,8	14,7	12,0	10,1	8,6
0,525	24,0	18,6	14,5	11,8	9,9	8,5
0,53	24,0	18,4	14,3	11,7	9,8	8,3
0,535	24,0	18,2	14,2	11,5	9,7	8,2
0,54	24,0	18,0	14,0	11,4	9,5	8,1
0,545	24,0	17,8	13,8	11,2	9,4	8,0
0,55	24,0	17,6	13,6	11,1	9,2	7,8

Table 14.7.1 Maximum container weights of ISO 1496-1:1990 20 ft containers stowed in 40 ft cell guides with no overstow; Container's Rated Weight = 24 t

Lowest tier Transverse acceleration (g)	Maximum homogeneous container weights, in tonnes									
	3 Tiers	4 Tiers	5 Tiers	6 Tiers	7 Tiers	8 Tiers	9 Tiers	10 Tiers	11 Tiers	12 Tiers
0,350	24,0	24,0	24,0	20,2	17,3	14,8	13,4	11,6	10,6	9,5
0,355	24,0	24,0	24,0	20,0	17,1	14,6	13,3	11,6	10,5	9,4
0,360	24,0	24,0	24,0	19,7	16,9	14,5	13,2	11,5	10,5	9,3
0,365	24,0	24,0	24,0	19,5	16,7	14,3	13,1	11,4	10,4	9,3
0,370	24,0	24,0	23,9	19,3	16,5	14,1	13,0	11,3	10,3	9,2
0,375	24,0	24,0	23,6	19,0	16,3	14,0	12,9	11,3	10,2	9,2
0,380	24,0	24,0	23,3	18,8	16,1	13,8	12,7	11,2	10,2	9,1
0,385	24,0	24,0	23,0	18,6	15,9	13,6	12,6	11,1	10,1	9,0
0,390	24,0	24,0	22,7	18,4	15,8	13,5	12,5	11,0	10,0	9,0
0,395	24,0	24,0	22,5	18,2	15,6	13,3	12,4	10,9	9,9	8,9
0,400	24,0	24,0	22,2	18,0	15,4	13,2	12,3	10,8	9,9	8,9
0,405	24,0	24,0	22,0	17,8	15,3	13,1	12,1	10,7	9,8	8,8
0,410	24,0	24,0	21,8	17,6	15,1	13,0	12,0	10,7	9,7	8,8
0,415	24,0	24,0	21,5	17,5	15,0	12,9	11,8	10,6	9,7	8,7
0,420	24,0	24,0	21,3	17,3	14,8	12,7	11,7	10,4	9,6	8,7
0,425	24,0	24,0	21,1	17,2	14,7	12,6	11,5	10,3	9,5	8,6
0,430	24,0	24,0	20,9	17,0	14,6	12,5	11,4	10,2	9,4	8,6
0,435	24,0	24,0	20,7	16,9	14,5	12,4	11,3	10,1	9,4	8,5
0,440	24,0	24,0	20,6	16,8	14,4	12,4	11,1	10,0	9,3	8,5
0,445	24,0	23,9	20,4	16,6	14,3	12,3	11,0	9,9	9,2	8,4
0,450	24,0	23,7	20,2	16,5	14,1	12,2	10,9	9,9	9,2	8,3
0,455	24,0	23,6	20,0	16,4	14,0	12,1	10,8	9,8	9,1	8,3
0,460	24,0	23,4	19,9	16,2	13,9	12,0	10,7	9,7	9,0	8,2
0,465	24,0	23,3	19,7	16,1	13,8	11,9	10,6	9,6	8,9	8,1
0,470	24,0	23,1	19,6	16,0	13,7	11,8	10,6	9,5	8,9	8,1
0,475	24,0	23,0	19,5	15,9	13,6	11,7	10,5	9,4	8,8	8,0
0,480	24,0	22,9	19,3	15,8	13,5	11,6	10,5	9,4	8,7	7,9
0,485	24,0	22,7	19,2	15,7	13,4	11,5	10,4	9,3	8,6	7,9
0,490	24,0	22,6	19,1	15,6	13,3	11,4	10,3	9,2	8,5	7,8
0,495	24,0	22,5	18,9	15,5	13,2	11,3	10,3	9,1	8,5	7,7
0,500	24,0	22,4	18,8	15,4	13,1	11,2	10,2	9,1	8,4	7,7
0,505	24,0	22,3	18,7	15,3	13,0	11,2	10,1	9,0	8,3	7,6
0,510	24,0	22,1	18,6	15,2	13,0	11,1	10,1	8,9	8,3	7,6
0,515	24,0	22,0	18,4	15,1	12,9	11,0	10,0	8,9	8,2	7,5
0,520	24,0	21,9	18,3	15,0	12,8	10,9	9,9	8,8	8,1	7,4
0,525	24,0	21,8	18,2	14,9	12,7	10,9	9,9	8,7	8,1	7,4
0,530	24,0	21,7	18,1	14,8	12,6	10,8	9,8	8,7	8,0	7,3
0,535	24,0	21,6	18,0	14,7	12,5	10,7	9,7	8,6	8,0	7,3
0,540	24,0	21,5	17,9	14,6	12,4	10,6	9,6	8,5	7,9	7,2
0,545	24,0	21,4	17,7	14,5	12,3	10,6	9,6	8,5	7,8	7,1
0,550	24,0	21,3	17,6	14,4	12,3	10,5	9,5	8,4	7,8	7,1
0,555	24,0	21,2	17,5	14,3	12,2	10,4	9,4	8,4	7,7	7,0
0,560	24,0	21,1	17,4	14,2	12,1	10,4	9,3	8,3	7,7	7,0
0,565	24,0	21,0	17,3	14,2	12,0	10,3	9,3	8,3	7,6	6,9
0,570	24,0	20,9	17,2	14,1	11,9	10,2	9,2	8,2	7,6	6,9
0,575	24,0	20,8	17,1	14,0	11,9	10,2	9,1	8,2	7,5	6,8
0,580	24,0	20,7	17,0	13,9	11,8	10,1	9,0	8,1	7,5	6,8
0,585	24,0	20,6	16,9	13,8	11,7	10,1	9,0	8,1	7,4	6,8
0,590	24,0	20,5	16,8	13,7	11,6	10,0	8,9	8,0	7,4	6,7
0,595	24,0	20,4	16,7	13,7	11,6	9,9	8,8	8,0	7,3	6,7
0,600	24,0	20,4	16,6	13,6	11,5	9,9	8,8	7,9	7,3	6,6
0,605	24,0	20,3	16,5	13,5	11,4	9,8	8,7	7,9	7,2	6,6
0,610	24,0	20,2	16,5	13,4	11,4	9,8	8,7	7,8	7,2	6,5
0,615	24,0	20,1	16,4	13,4	11,3	9,7	8,6	7,8	7,1	6,5
0,620	24,0	20,0	16,3	13,3	11,2	9,7	8,6	7,7	7,1	6,5
0,625	24,0	20,0	16,2	13,2	11,2	9,6	8,6	7,7	7,0	6,4
0,630	24,0	19,9	16,1	13,1	11,1	9,6	8,5	7,6	7,0	6,4
0,635	24,0	19,8	16,0	13,1	11,1	9,5	8,5	7,6	6,9	6,3
0,640	24,0	19,7	15,9	13,0	11,0	9,5	8,4	7,5	6,9	6,3
0,645	24,0	19,7	15,9	12,9	10,9	9,4	8,4	7,5	6,9	6,3
0,650	24,0	19,6	15,8	12,9	10,9	9,4	8,4	7,5	6,8	6,2

Table 14.7.2 Maximum container weights of ISO 1496-1:1990 20 ft containers stowed in 40 ft cell guides with no overstow; Container's Rated Weight = 30,5 t

Lowest tier Transverse acceleration (g)	Maximum homogeneous container weights, in tonnes									
	3 Tiers	4 Tiers	5 Tiers	6 Tiers	7 Tiers	8 Tiers	9 Tiers	10 Tiers	11 Tiers	12 Tiers
0,350	30,5	28,1	25,0	20,2	17,3	14,8	13,4	11,6	10,6	9,5
0,355	30,5	27,8	24,7	20,0	17,1	14,6	13,3	11,6	10,5	9,4
0,360	30,5	27,6	24,4	19,7	16,9	14,5	13,2	11,5	10,5	9,3
0,365	30,5	27,3	24,1	19,5	16,7	14,3	13,1	11,4	10,4	9,3
0,370	30,5	27,0	23,9	19,3	16,5	14,1	13,0	11,3	10,3	9,2
0,375	30,5	26,7	23,6	19,0	16,3	14,0	12,9	11,3	10,2	9,2
0,380	30,5	26,4	23,3	18,8	16,1	13,8	12,7	11,2	10,2	9,1
0,385	30,5	26,2	23,0	18,6	15,9	13,6	12,6	11,1	10,1	9,0
0,390	30,5	25,9	22,7	18,4	15,8	13,5	12,5	11,0	10,0	9,0
0,395	30,5	25,7	22,5	18,2	15,6	13,3	12,4	10,9	9,9	8,9
0,400	30,5	25,4	22,2	18,0	15,4	13,2	12,3	10,8	9,9	8,9
0,405	30,5	25,2	22,0	17,8	15,3	13,1	12,1	10,7	9,8	8,8
0,410	30,5	25,0	21,8	17,6	15,1	13,0	12,0	10,7	9,7	8,8
0,415	30,5	24,8	21,5	17,5	15,0	12,9	11,8	10,6	9,7	8,7
0,420	30,5	24,7	21,3	17,3	14,8	12,7	11,7	10,4	9,6	8,7
0,425	30,5	24,5	21,1	17,2	14,7	12,6	11,5	10,3	9,5	8,6
0,430	30,5	24,3	20,9	17,0	14,6	12,5	11,4	10,2	9,4	8,6
0,435	30,5	24,2	20,7	16,9	14,5	12,4	11,3	10,1	9,4	8,5
0,440	30,5	24,0	20,6	16,8	14,4	12,4	11,1	10,0	9,3	8,5
0,445	30,5	23,9	20,4	16,6	14,3	12,3	11,0	9,9	9,2	8,4
0,450	30,5	23,7	20,2	16,5	14,1	12,2	10,9	9,9	9,2	8,3
0,455	30,5	23,6	20,0	16,4	14,0	12,1	10,8	9,8	9,1	8,3
0,460	30,5	23,4	19,9	16,2	13,9	12,0	10,7	9,7	9,0	8,2
0,465	30,5	23,3	19,7	16,1	13,8	11,9	10,6	9,6	8,9	8,1
0,470	30,5	23,1	19,6	16,0	13,7	11,8	10,6	9,5	8,9	8,1
0,475	30,5	23,0	19,5	15,9	13,6	11,7	10,5	9,4	8,8	8,0
0,480	30,5	22,9	19,3	15,8	13,5	11,6	10,5	9,4	8,7	7,9
0,485	30,5	22,7	19,2	15,7	13,4	11,5	10,4	9,3	8,6	7,9
0,490	30,5	22,6	19,1	15,6	13,3	11,4	10,3	9,2	8,5	7,8
0,495	30,5	22,5	18,9	15,5	13,2	11,3	10,3	9,1	8,5	7,7
0,500	30,5	22,4	18,8	15,4	13,1	11,2	10,2	9,1	8,4	7,7
0,505	30,5	22,3	18,7	15,3	13,0	11,2	10,1	9,0	8,3	7,6
0,510	30,4	22,1	18,6	15,2	13,0	11,1	10,1	8,9	8,3	7,6
0,515	30,4	22,0	18,4	15,1	12,9	11,0	10,0	8,9	8,2	7,5
0,520	30,4	21,9	18,3	15,0	12,8	10,9	9,9	8,8	8,1	7,4
0,525	30,4	21,8	18,2	14,9	12,7	10,9	9,9	8,7	8,1	7,4
0,530	30,4	21,7	18,1	14,8	12,6	10,8	9,8	8,7	8,0	7,3
0,535	30,3	21,6	18,0	14,7	12,5	10,7	9,7	8,6	8,0	7,3
0,540	30,3	21,5	17,9	14,6	12,4	10,6	9,6	8,5	7,9	7,2
0,545	30,2	21,4	17,7	14,5	12,3	10,6	9,6	8,5	7,8	7,1
0,550	30,1	21,3	17,6	14,4	12,3	10,5	9,5	8,4	7,8	7,1
0,555	29,9	21,2	17,5	14,3	12,2	10,4	9,4	8,4	7,7	7,0
0,560	29,8	21,1	17,4	14,2	12,1	10,4	9,3	8,3	7,7	7,0
0,565	29,6	21,0	17,3	14,2	12,0	10,3	9,3	8,3	7,6	6,9
0,570	29,4	20,9	17,2	14,1	11,9	10,2	9,2	8,2	7,6	6,9
0,575	29,1	20,8	17,1	14,0	11,9	10,2	9,1	8,2	7,5	6,8
0,580	28,9	20,7	17,0	13,9	11,8	10,1	9,0	8,1	7,5	6,8
0,585	28,7	20,6	16,9	13,8	11,7	10,1	9,0	8,1	7,4	6,8
0,590	28,5	20,5	16,8	13,7	11,6	10,0	8,9	8,0	7,4	6,7
0,595	28,3	20,4	16,7	13,7	11,6	9,9	8,8	8,0	7,3	6,7
0,600	28,2	20,4	16,6	13,6	11,5	9,9	8,8	7,9	7,3	6,6
0,605	28,1	20,3	16,5	13,5	11,4	9,8	8,7	7,9	7,2	6,6
0,610	28,0	20,2	16,5	13,4	11,4	9,8	8,7	7,8	7,2	6,5
0,615	28,0	20,1	16,4	13,4	11,3	9,7	8,6	7,8	7,1	6,5
0,620	28,0	20,0	16,3	13,3	11,2	9,7	8,6	7,7	7,1	6,5
0,625	27,9	20,0	16,2	13,2	11,2	9,6	8,6	7,7	7,0	6,4
0,630	27,9	19,9	16,1	13,1	11,1	9,6	8,5	7,6	7,0	6,4
0,635	27,9	19,8	16,0	13,1	11,1	9,5	8,5	7,6	6,9	6,3
0,640	27,9	19,7	15,9	13,0	11,0	9,5	8,4	7,5	6,9	6,3
0,645	27,9	19,7	15,9	12,9	10,9	9,4	8,4	7,5	6,9	6,3
0,650	27,9	19,6	15,8	12,9	10,9	9,4	8,4	7,5	6,8	6,2

Table 14.7.4 *has been renumbered* Table 14.7.3.

■ *Section 8*
Determination of forces for container securing arrangements

8.1 General

8.1.1 The forces acting in the securing system are to be determined for each loading condition and associated set of motions of the ship. Although the operation of anti-roll devices or other systems may improve the behavior of the ship in seaways, the effect of such devices should not be taken into account to reduce the determination of the forces for container securing arrangements.

8.1.4 Wind forces are generally to be based on a maximum wind speed of 40 m/s. Only positive forces of wind pressure need to be applied. That means no suction forces need to be taken into consideration.

8.1.7 Forces due to pretensioning the securing devices need not, in general, be included in the calculation provided they do not exceed ~~500 kg~~ 5 kN in any one item. Special consideration will be given to cases where forces obtained from pre-stressing are an integral part of the design of the system.

8.1.8 For ships having the class notation **Container Ship**, an effective breakwater is to be fitted to protect the containers against green sea impact loads. For other ships which are equipped for the carriage of containers on deck, protection of the cargo is recommended by the provision of a breakwater.

Table 14.8.2 Components of forces

Source	Component of force, in ~~tonnes~~ kN		
	~~Pressure~~ Compression (normal to deck)	Sliding (parallel to deck)	
		transverse	longitudinal
STATIC			
Roll	$Wg \cos \phi$	$Wg \sin \phi$	
Pitch	$Wg \cos \psi$		$Wg \sin \psi$
Combined	$Wg \cos (0{,}71\phi) \cos (0{,}71\psi)$	$Wg \sin (0{,}71\phi)$	$Wg \sin (0{,}71\psi)$
DYNAMIC			
Roll	$\cancel{0{,}07024W \frac{\phi}{T_r^2} y}$ $0{,}07Wg \frac{\phi}{T_r^2} y$	$\cancel{0{,}07024W \frac{\phi}{T_r^2} z_m}$ $0{,}07Wg \frac{\phi}{T_r^2} z_m$	
Pitch	$\cancel{0{,}07024W \frac{\psi}{T_p^2} x}$ $0{,}07Wg \frac{\psi}{T_p^2} x$		$\cancel{0{,}07024W \frac{\psi}{T_p^2} z_m}$ $0{,}07Wg \frac{\psi}{T_p^2} z_m$
Heave:			
Roll	$\cancel{0{,}05W \frac{L_{pp}}{T_h^2} \cos \phi}$ $0{,}05Wg \frac{L_{pp}}{T_h^2} \cos \phi$	$\cancel{0{,}05W \frac{L_{pp}}{T_h^2} \sin \phi}$ $0{,}05Wg \frac{L_{pp}}{T_h^2} \sin \phi$	
Pitch	$\cancel{0{,}05W \frac{L_{pp}}{T_h^2} \cos \psi}$ $0{,}05Wg \frac{L_{pp}}{T_h^2} \cos \psi$		$\cancel{0{,}05W \frac{L_{pp}}{T_h^2} \sin \psi}$ $0{,}05Wg \frac{L_{pp}}{T_h^2} \sin \psi$
WIND		$\cancel{8{,}25AV^2 \cos \phi \times 10^{-5}}$ Roll $8{,}25AV_W^2 \cos^2 \phi \times 10^{-4}$ Pitch $8{,}25AV_W^2 \times 10^{-4}$ Combined $8{,}25AV_W^2 \cos^2 (0{,}71\phi) \times 10^{-4}$	

NOTES
1. For definition of terms, *see* 1.4.1 and Fig. 14.8.1.
2. The appropriate signs are to be used in calculating vector components of forces.

~~8.1.8~~ *8.1.9* Consideration is to be given to the forces from wave impact and shipping green seas where the form and proportions of the ship are such that these may occur. In general the strength of containers and the strength of the securing arrangements in the forward $0,25L_{pp}$ are to be suitable for forces increased by 20 per cent above the values calculated from these requirements~~, except where it can be shown that the containers are adequately protected by break-waters or similar structure~~. The increase of forces is to be applied to the outer exposed containers.

8.2 Resultant forces

8.2.2 The instantaneous maximum value of the resultants of the forces depends upon the phase relationship between the ship motions. This relationship may be derived from model testing where carried out for the specific ship, from ~~strip theory~~ ship motion analysis or from full scale measurements if carried out for a ship of similar geometry.

8.2.4 The summation of the individual components of force for one container above or below the centre of motion is shown for the Rolling condition in Fig. 14.8.2, and the resultants are obtained from the following expressions:

(a) Bottom of motions, *see* 8.2.3 (a)(i):

~~Pressure~~ Compression

$$\cancel{P_{max} = W\left[\left(1 + \frac{0,05L_{pp}}{T_h^2}\right)\cos\phi + \frac{0,07024\phi}{T_r^2}\,y\right]}$$

$$P_{max} = Wg\left[\left(1 + \frac{0,05L_{pp}}{T_h^2}\right)\cos\phi + \frac{0,07\phi}{T_r^2}\,y\right]$$

Sliding (transverse)

$$\cancel{H_{max} = W\left[\left(1 + \frac{0,05L_{pp}}{T_h^2}\right)\sin\phi + \frac{0,07024\phi}{T_r^2}\,z_m\right]}$$

$$H_{max} = Wg\left[\left(1 + \frac{0,05L_{pp}}{T_h^2}\right)\sin\phi + \frac{0,07\phi}{T_r^2}\,z_m\right]$$

(b) Top of motions, *see* 8.2.3(a)(ii):

~~Pressure~~ Compression

$$\cancel{P_{min} = W\left[\left(1 - \frac{0,05L_{pp}}{T_h^2}\right)\cos\phi - \frac{0,07024\phi}{T_r^2}\,y\right]}$$

$$P_{min} = Wg\left[\left(1 - \frac{0,05L_{pp}}{T_h^2}\right)\cos\phi - \frac{0,07\phi}{T_r^2}\,y\right]$$

Sliding (transverse)

$$\cancel{H_{min} = W\left[\left(1 - \frac{0,05L_{pp}}{T_h^2}\right)\sin\phi + \frac{0,07024\phi}{T_r^2}\,z_m\right]}$$

$$H_{min} = Wg\left[\left(1 - \frac{0,05L_{pp}}{T_h^2}\right)\sin\phi + \frac{0,07\phi}{T_r^2}\,z_m\right]$$

The corresponding summations for the Pitching and Combined conditions may be written similarly.

■ *Section 9* Strength of container securing arrangements

9.1 Resultant applied forces

9.1.1 The resultant forces derived for each container in the stack in accordance with Section 8 are assumed to be divided equally between the walls of the container as follows:

H_i = sliding force in one transverse end = $\frac{H}{2}$ ~~tonnes~~ kN

J_i = sliding force in one longitudinal side = $\frac{J}{2}$ ~~tonnes~~ kN

P_i = vertical force in each corner post = $\frac{P}{4}$ ~~tonnes~~ kN

Q_i = wind force in one transverse end = $\frac{Q}{2}$ ~~tonnes~~ kN

The subscript i refers to any particular container.

9.1.2 The sliding forces H_i and J_i are taken to act at ~~a mean height of~~ one third the height of the container above its base. That is, the force may be distributed as to $\frac{H_i}{3}$ $\left(\text{or } \frac{J_i}{3}\right)$ acting at the top of the container and $\frac{2H_i}{3}$ $\left(\text{or } \frac{2J_i}{3}\right)$ acting at the bottom, *see* Fig. 14.9.1.

9.2 Forces in an unlashed stack

9.2.4 The resultant forces in the securing devices and supports are not to exceed the allowable working loads for which the device has been approved, *see* Sections 2 and 3.

9.2.5 For exposed stacks in the forward $0,25L_{pp}$, *see* ~~8.1.7~~ 8.1.9.

~~**Table 14.9.1 Forces in an unlashed stack**~~

Force	Symbol	Expression	Unit
Racking force per container wall:			
transverse	F	$\sum_{i=1}^{i} F_i$	t
longitudinal	G	$\sum_{i=1}^{i} G_i$	t
Shear force per corner:			
transverse	S_{yz}	$0{,}55 \sum_{i=1}^{i} H_i + Q_i$	t
longitudinal	S_{xz}	$0{,}55 \sum_{i=1}^{i} J_i$	t
Vertical reaction to tipping per corner:			
transverse	R_{yz}	$\frac{1}{a} \sum_{i=1}^{i} F_i z_i$ *See* Notes 1 and 2	t
longitudinal	R_{xz}	$\frac{1}{b} \sum_{i=1}^{i} G_i z_i$ *See* Notes 1 and 2	t
Vertical pressure per corner	P_i	$\sum_{i=1}^{i} P_i$ *See* Note 2	t
Resultant compressive force per corner:			
Maximum transverse		P_i max. + R_{yz} max.	t
Minimum transverse		P_i max. – R_{yz} max.	t
		or P_i min. – R_{yz} min. *See* Note 3	t
Maximum longitudinal		P_i max. + R_{xz} max.	t
Minimum longitudinal		P_i max. – R_{xz} max.	t
		or P_i min. – R_{xz} min. *See* Note 3	t
NOTES 1. z_i is the distance from the level under consideration to the top of each container above that level, in metres. 2. Both the maximum and the minimum values are to be calculated. 3. Whichever is the lesser. A negative value indicates separation.			

Table 14.9.1 Forces in an unlashed stack

Force, in kN	Symbol	Expression	Remark
Racking force per corner wall:			
Transverse	RA_{yi}	$RA_{yi} = \sum_{j=i}^{n} F_j$	n: total numbers of tiers
Longitudinal	RA_{xi}	$RA_{xi} = \sum_{j=i}^{n} G_j$	
Shear force per corner:			
Transverse	SF_{yi}	$SF_{yi} = 0{,}55 \sum_{j=i}^{n} (H_j + Q_j)$	Q_j: exposed stack only
Longitudinal	SF_{xi}	$SF_{xi} = 0{,}55 \sum_{j=i}^{n} J_j$	
Vertical reaction to tipping per corner:			
Transverse	V_{yi}	$V_{yi} = \frac{1}{a} \sum_{j=i}^{n} F_j z_j$	*See* Notes 1 and 2
Longitudinal	V_{xi}	$V_{xi} = \frac{1}{b} \sum_{j=i}^{n} G_j z_j$	*See* Notes 1 and 2
Vertical pressure per corner	VP_i	$VP_i = \sum_{j=i}^{n} P_j$	*See* Note 2
Resultant compressive force per corner:			
Maximum transverse		VP_i max. + V_{yi} max.	*See* Note 3
Minimum transverse		VP_i max. – V_{yi} max.	
		or VP_i min. – V_{yi} min.	
Maximum longitudinal		VP_i max. + V_{xi} max.	*See* Note 3
Minimum longitudinal		VP_i max. – V_{xi} max.	
		or VP_i min. – V_{xi} min.	

NOTES
1. z_j is the distance from the level under consideration to the top of each container above that level, in metres.
2. Both the maximum and the minimum values are to be calculated.
3. Whichever is the lesser. A negative value induces separation.

9.3 Arrangements incorporating lashings ~~or buttresses~~

(Part only shown)

9.3.1 Where the securing arrangements incorporate lashings, proper allowance is to be made for flexibility of the system. For this purpose, the following values may be adopted:

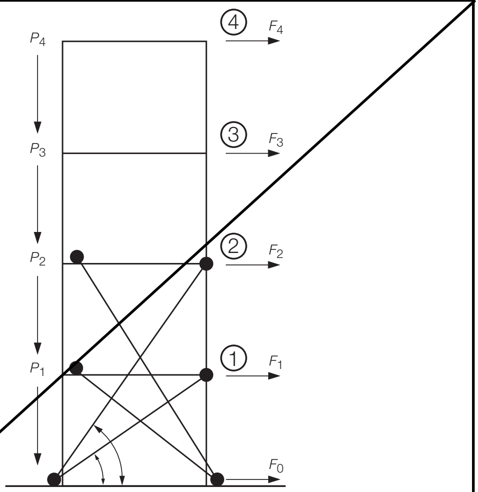
(c) **Elongation of lashings.** Elongation is to be determined by reference to the effective modulus of elasticity of the lashing (allowance for straightening and stretching) which, in the absence of actual test values, may be taken as:

steel rod lashings of hook type turnbuckle	~~9,8 t/mm²~~ 98 kN/mm²
short (one tier) steel rod lashings (knob type), incl. turnbuckle and lashing eyes	140 kN/mm²
long (two tier) steel rod lashings (knob type), incl. turnbuckle and lashing eyes	175 kN/mm²
steel wire rope lashings	~~9,0 t/mm²~~ 90 kN/mm²
steel chain lashings (based on the nominal diameter of the chain)	~~8,0 t/mm²~~ 80 kN/mm²
Adjustable tension/ compression buttress	~~12,0 t/mm²~~ 120 kN/mm²
Aluminium or other materials	To be considered.

Table 14.9.2 Spring constants for containers

Height (m)	Door end ~~(t/mm)~~ kN/mm	Closed end ~~(t/mm)~~ kN/mm	~~Side wall (t/mm)~~
2,438	~~0,37~~ 3,7	~~1,67~~ 16,7	~~0,61~~
2,591	~~0,35~~ 3,5	~~1,54~~ 15,4	~~0,57~~
2,743	~~0,33~~ 3,3	~~1,43~~ 14,3	~~0,54~~
2,896	~~0,32~~ 3,2	~~1,33~~ 13,3	~~0,51~~

9.3.3 When paired lashings (para-lash arrangements) are used, for the purpose for lashing calculations a cross-sectional area equal to 150 per cent of the cross-sectional area of one lashing is to be used ~~unless an equalising system is fitted. If an equalising system is fitted, the sum of the cross-sectional areas is to be used~~.



~~**Fig. 14.9.2 Container stack load system**~~

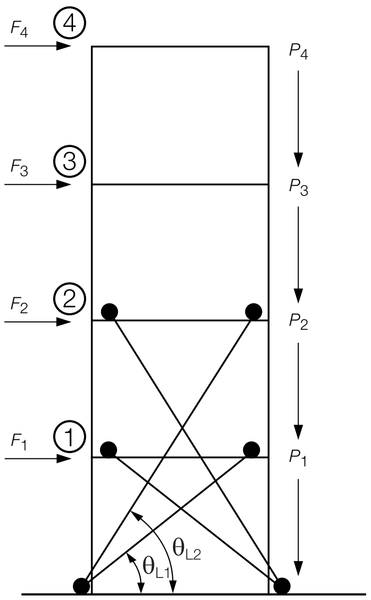
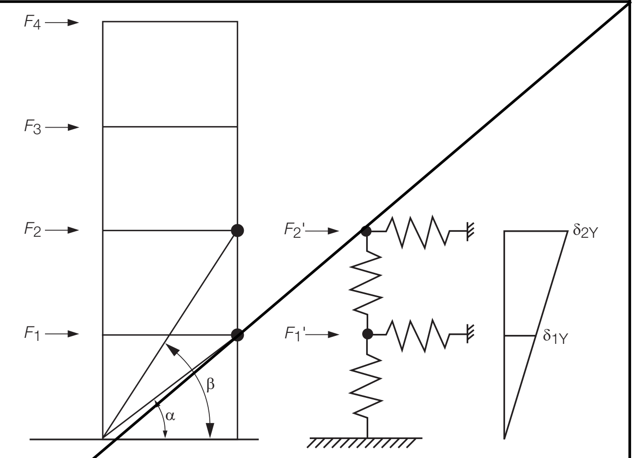


Fig. 14.9.2 Container stack load system



~~**Fig. 14.9.3 Container stack load system**~~

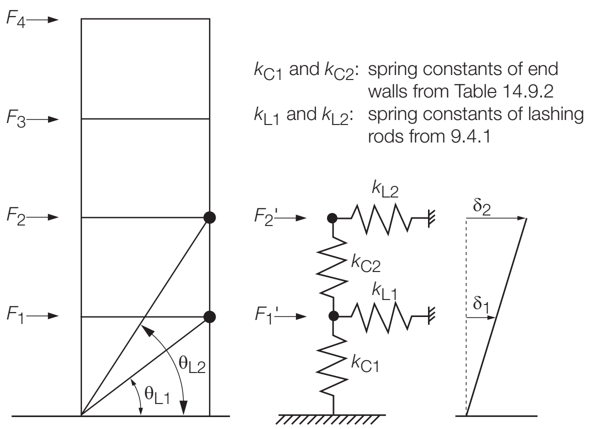


Fig. 14.9.3 Container stack load system

9.4 Tensions in the lashing rods

9.4.1 For conventional arrangements, the spring constant for the lashing rod may be determined using the expression:

$$k_L = \frac{E \cancel{\cdot} A \cancel{\cdot} \mathrm{Cos}^2\, \theta_L}{l_L}$$

However, some stowage arrangements may result in considerable longitudinal displacement between the base of the lashing and the fitting in the container corner, i.e. 40~~'~~ ft container in a 45~~'~~ ft bay. In such cases the spring constant of the lashing rod should be determined using the following expression:

$$k_L = \frac{E \cancel{\cdot} A \cancel{\cdot} l_y^2}{l_L^3}$$

where

~~y = transverse span of lashing, in mm~~

E = Effective Modulus of Elasticity ~~(t/mm²)~~ (kN/mm²)

A = cross-section area of lashing rod, in mm²

l_L = length of lashing (mm) given by

$l_L = \sqrt{l_x^2 + l_y^2 + l_z^2}$

l_x = longitudinal separation of lashing ends measured parallel to ship's X axis, in mm

l_y = transverse separation of lashing ends measured parallel to ship's Y axis, in mm

l_z = vertical separation of lashing ends measured parallel to ship's Z axis, in mm

θ_L = lashing angle, in degrees.

In case of the aforementioned configuration, attention is to be paid to the fact that the arrangement of the fixed lashing plates is to be suitable to accommodate the inclined lashing rods. In addition, attention should be paid to the design of the heads of the lashing rods being suitable to secure the container under the angle of inclination.

9.4.2 The expressions for the tensions in the lashing rods will vary with the lashing arrangement used, however, for the three cases below the expressions for the lashing rod tensions are summarised in Table ~~14.9.4~~ 14.9.3:

(a) Single cross lashed stack.
(b) Double cross lashed stack.
~~(c) Double cross lashed stack to lashing bridge.~~

9.5 Residual forces

9.5.1 The residual transverse force in the containers at the level of the lashing is:

Lower $F_{1,RES} = F_1 - T_{L1} \cos \cancel{\alpha}\, \theta_{L1}$ ~~(tonnes)~~ (kN)

Upper $F_{2,RES} = F_2 - T_{L2} \cos \cancel{\beta}\, \theta_{L2}$ ~~(tonnes)~~ (kN)

The racking and shearing forces in the container stack may then be determined in accordance with 9.2.2 using the residual transverse forces. The maximum and minimum vertical forces in the corner posts may be determined similarly taking due account of the vertical component of lashing tension where applicable.

9.5.4 Where external support is provided by a buttress or shore the load is to be transmitted between adjacent stacks by linkages in line with the support. The force in the transverse end frame members of the containers adjacent to the support is given by:

$F_b\left(\frac{2N-1}{2N}\right)$ ~~tonnes~~ kN and the force in the linkage to the adjacent container is $F_b\left(\frac{N-1}{N}\right)$ ~~tonnes~~ kN

where

F_b = calculated force in the buttress or shore, in ~~tonnes~~ kN

N = number of rows of containers supported by the buttress or shore.

9.7 Allowable forces on containers

9.7.1 For ISO containers, the securing arrangements are to be designed so that the forces on the containers do not exceed the values shown in Table 14.9.4. The maximum forces for ISO 1496-1: ~~1984~~ 1990 including Amendment Nos. 1, 2 and 3 containers are illustrated in Fig. 14.9.4. Proposals to carry out the lashing calculations for containers manufactured in accordance with ISO 1496-1:1990/Amendment No. 4, 2006 will be specially considered.

9.7.2 The allowable forces for containers of other dimensions, e.g. 24 ft, 48 ft and 53 ft, will be determined on the basis of the values in Table ~~14.9.3~~ 14.9.4 and of the forces for which the container has been certified.

9.7.3 Where 45 ft containers in accordance with ISO 1496-1:1990/Amd.4, 2006 are stowed on top of a 40 ft container, the corner post load of the top castings of the 45 ft container are not to exceed a compression force of 404 kN. Consideration should be given to the strength of the container bottom structure to withstand the forces transmitted. No lashings are to be applied to the ends of the 45 ft container if stowed on top of a 40 ft unit.

~~**Table. 14.9.3 Summary of container securing methods**~~

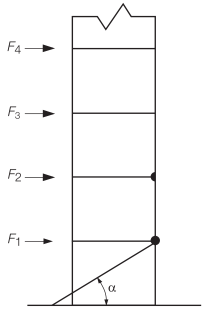
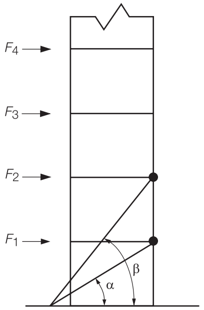
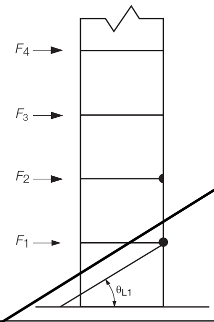
Arrangement	F'_x	Tension in lashing	Residual transverse Forces at lashing level
	$F'_1 = \sum_{i=1}^{n} F_i$	$T_{L1} = \dfrac{k_{L1} \cdot F'_1}{(k_{C1} + k_{L1}) \cos\alpha}$	$F_{1,RES} = F_1 - T_{L1} \cdot \cos\alpha$
	$F'_2 = \sum_{i=2}^{n} F_i$	$T_{L1} = \dfrac{k_{L1}}{\cos\alpha} \cdot \dfrac{(k_{C2} + k_{L2})\, F'_1 + k_{C2} \cdot F'_2}{(k_{C1} + k_{C2} + k_{L1})\,(k_{C2} + k_{L2}) - k^2_{C2}}$ $T_{L2} = \dfrac{k_{L2}}{\cos\beta} \cdot \dfrac{k_{C2} \cdot F_1 + (k_{C1} + k_{C2} + k_{L1})\, F'_2}{(k_{C1} + k_{C2} + k_{L1})\,(k_{C2} + k_{L2}) - k^2_{C2}}$	$F_{1,RES} = F_1 - T_{L1} \cdot \cos\alpha$ $F_{2,RES} = F_2 - T_{L2} \cdot \cos\beta$
	$F'_3 = \sum_{i=3}^{n} F_i$	$T_{L1} = \dfrac{k_{L1}}{\cos\beta} \cdot \dfrac{F_1\,[(k_{C3} + k_{L2,Y})\, k_{C2}] + F_2\,[(k_{C1} + k_{C2})\,(k_{C3} + k_{L2.Y})] + F_3\,[(k_{C1} + k_{C2})\, k_{C3}]}{(k_{C1} + k_{C2})\,[(k_{C2} + k_{C3} + k_{L1,Y})\,(k_{C3} + k_{L2,Y}) - k^2_{C3}] - k^2_{C2}\,(k_{C3} + k_{L2,Y})}$ $T_{L2} = \dfrac{k_{L2}}{\cos\beta} \cdot \dfrac{F_1\,(k_{C2} \cdot k_{C3}) + F_2\,[(k_{C1} + k_{C2})\, k_{C3}] + F_3\,[(k_{C1} + k_{C2})\,(k_{C2} + k_{C3} + k_{L1.Y}) - k^2_{C2}]}{(k_{C1} + k_{C2})\,[(k_{C2} + k_{C3} + k_{L1,Y})\,(k_{C3} + k_{L2,Y}) - k^2_{C3}] - k^2_{C2}\,(k_{C3} + k_{L2,Y})}$	$F_{2,RES} = F_2 - T_{L1} \cdot \cos\alpha$ $F_{3,RES} = F_3 - T_{L2} \cdot \cos\beta$

Table. 14.9.3 Lashing rod tensions and residual forces calculation

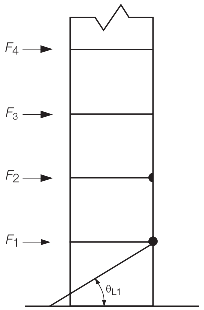
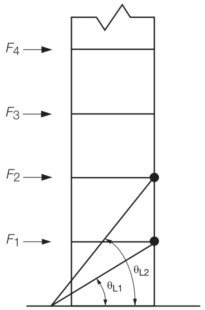
Arrangement	F'_x	Tension in lashing	Residual transverse Forces at lashing level
	$F'_1 = \sum_{i=1}^{n} F_i$	$T_{L1} = \dfrac{k_{L1} F'_1}{(k_{C1} + k_{L1}) \cos\theta_{L1}}$	$F_{1,RES} = F_1 - T_{L1} \cos\theta_{L1}$
	$F'_2 = \sum_{i=2}^{n} F_i$	$T_{L1} = \dfrac{k_{L1}}{\cos\theta_{L1}} \dfrac{(k_{C2} + k_{L2}) F'_1 - k_{L2} F'_2}{(k_{C1} + k_{L1})(k_{C2} + k_{L2}) + k_{C2} k_{L2}}$ $T_{L2} = \dfrac{k_{L2}}{\cos\theta_{L2}} \dfrac{k_{C2} F'_1 + (k_{C1} + k_{L1}) F'_2}{(k_{C1} + k_{L1})(k_{C2} + k_{L2}) + k_{C2} k_{L2}}$	$F_{1,RES} = F_1 - T_{L1} \cos\theta_{L1}$ $F_{2,RES} = F_2 - T_{L2} \cos\theta_{L2}$

Table 14.9.4 Allowable forces on ISO containers

	ISO 1496-1:1984 20 ft	ISO 1496-1:1984 40 ft	ISO 1496-1:1990 incl. up to Amendment No.3 20 ft	ISO 1496-1:1990 incl. up to Amendment No.3 40 ft
	in ~~tonnes~~ kN			
Horizontal force from ~~lashing on~~ a container fitting acting parallel to the side face~~, *see* Note 1~~	15,0	15,0	~~15,0~~ 150	~~15,0~~ 150
Horizontal force from lashing on container fitting acting parallel to the end face, *see* Note 1	22,5	22,5	~~22,5~~ 225	~~22,5~~ 225
Vertical force from lashing on container fitting acting parallel to the ~~side~~ end or side face, *see* Note 1	30,0	30,0	~~30,0~~ 250	~~30,0~~ 250
Racking force on container end	15,0	15,0	~~15,0~~ 150	~~15,0~~ 150
Racking force on container side	10,0	10,0	~~10,0~~ 150	~~10,0~~ 150
Vertical forces at each top corner, tension	15,0	15,0	~~25,0~~ 250	~~25,0~~ 250
Vertical forces at each bottom corner, tension	20,0	20,0	~~25,0~~ 250	~~25,0~~ 250
Vertical forces at each top corner post, compression	2,25*R*	2,25*R*	~~86,4~~ 848	~~86,4~~ 848
Vertical force at each bottom corner casting of the lowest container in a stack, compression			848 + (1,8Rg)/4 *see* Note 3	848 + (1,8Rg)/4 *see* Note 3
Transverse forces acting at the level of and parallel to the top face, tension or compression, *see* Note 2	22,5	34,0	~~34,0~~ 340	~~34,0~~ 340
Transverse forces acting at the level of and parallel to the bottom face, tension or compression, *see* Note 2	35,0	50,0	~~50,0~~ 500	~~50,0~~ 500

NOTES

1. In no case is the resultant of the horizontal and the vertical forces to exceed the limiting value derived from Fig. ~~14.9.3(a)~~ 14.9.4(a). The horizontal and vertical forces are the maximum components of a diagonal force and are not to be used as the maximum load if horizontal or vertical lashings are employed.
2. Where a buttress supports the stack at an intermediate level, the total transverse force in the containers at the level is not to exceed the sum of the appropriate top and bottom forces.
3. The vertical compression force on the lower corner casting on the closed end of the lowest container may exceed 848 + (1,8Rg/4) kN, provided the following conditions are complied with:
   (a) The vertical compression force acting on the lowest container from the container above does not exceed 848 kN.
   (b) The horizontal racking force acting on the lowest container from the container above does not exceed 150 kN.
   (c) The local ship side or hatch cover container foundation is designed and approved for the increased design compression force.
   (d) The loose bottom container securing fittings should have a contact area fulfilling the requirements of 3.2.4.

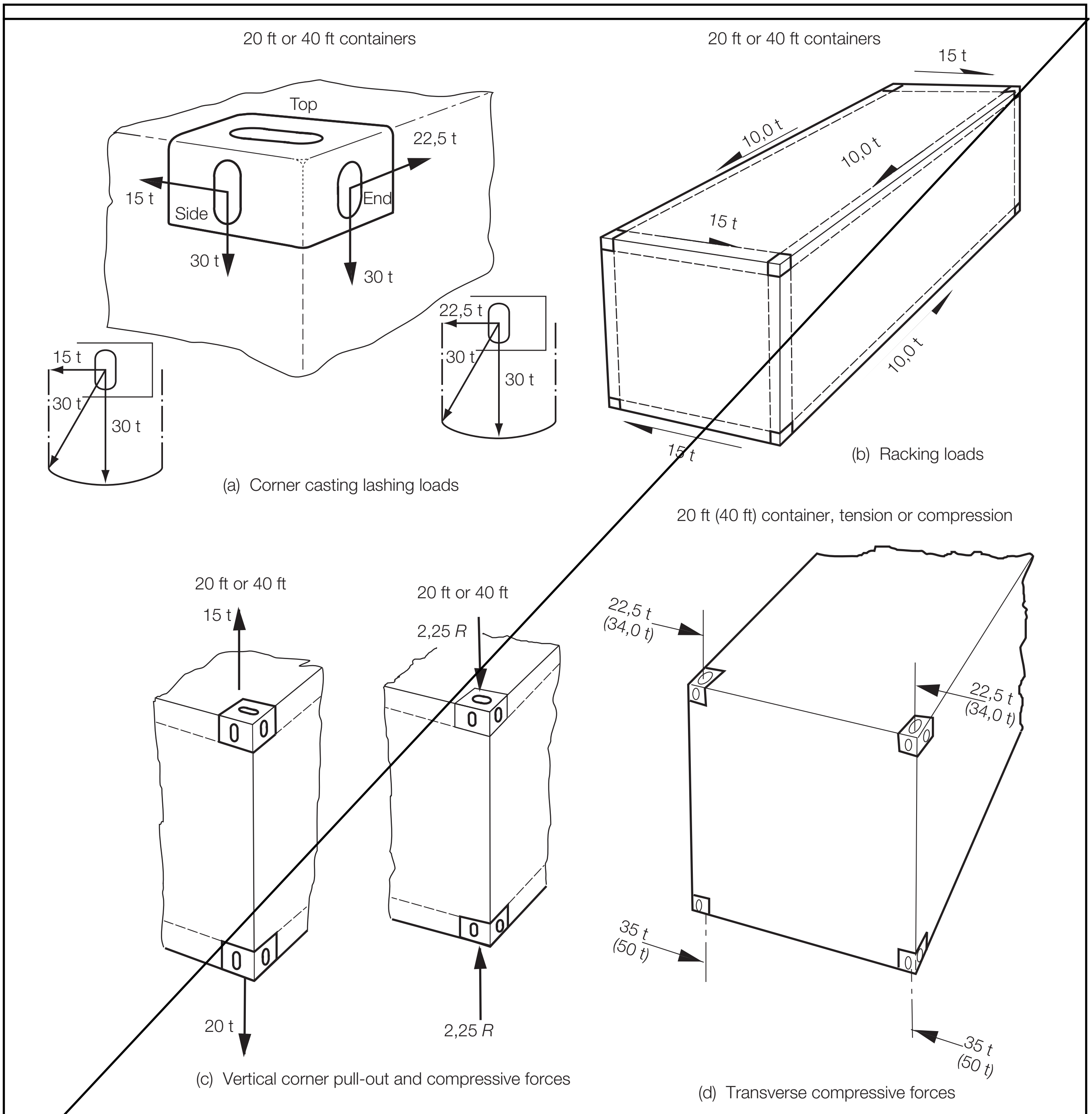
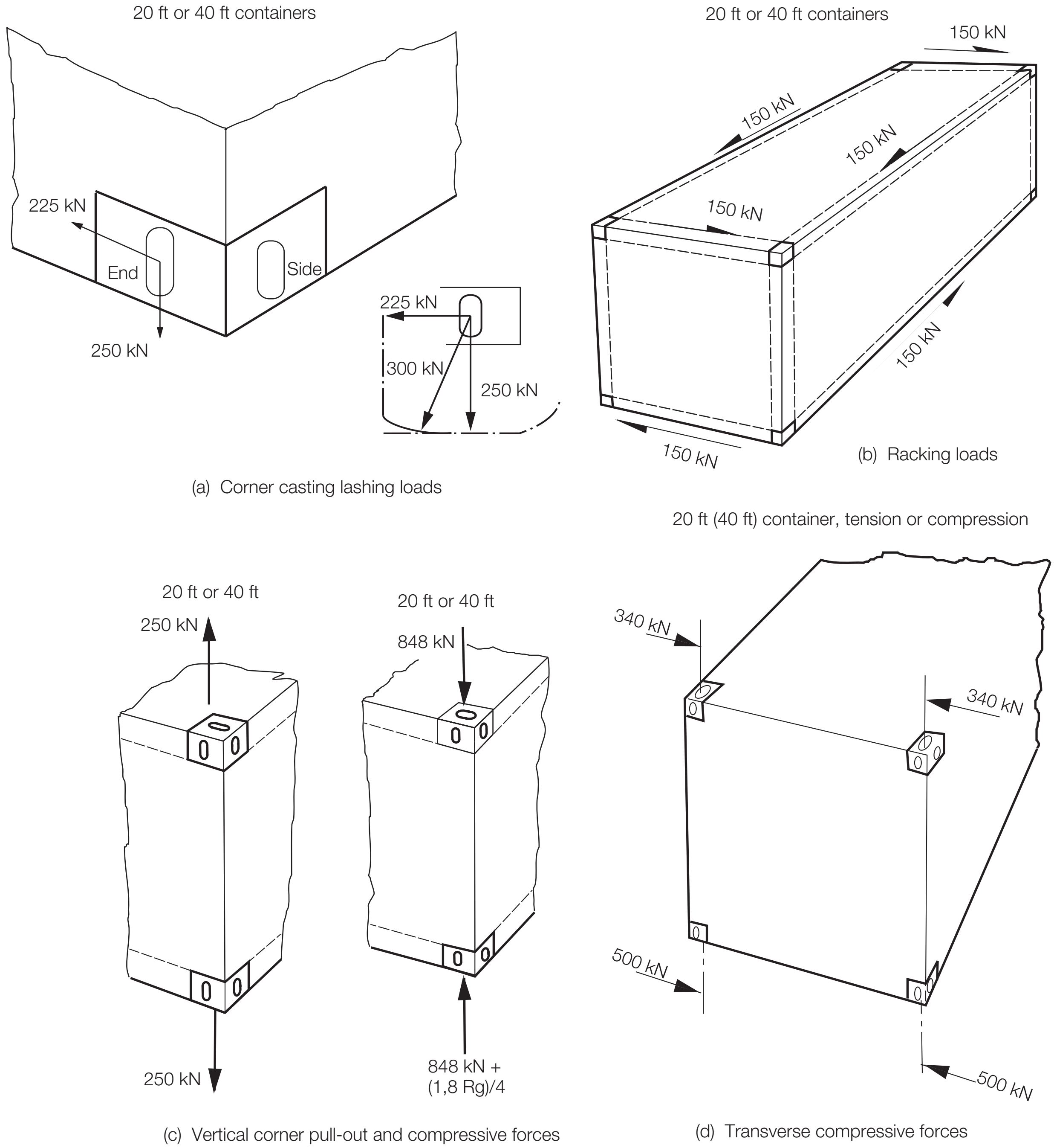


Fig. 14.9.4 Allowable forces for 20 ft or 40 ft ISO 1496-1: 1984 containers



(a) Corner casting lashing loads

(b) Racking loads

(c) Vertical corner pull-out and compressive forces

(d) Transverse compressive forces

Fig. 14.9.4
Allowable forces for 20 ft or 40 ft containers constructed to ISO 1496-1:1990 including Amendment Nos. 1, 2 and 3

Section 10
Surveys

10.1 Initial Survey

10.1.1 The following requirements are mandatory for fixed fittings including cell guides, if fitted, on all ships. For ships having a **CCSA** class notation the requirements are also applicable for loose fittings.

Existing paragraph 10.1.1 *has been renumbered* 10.1.2*.*

.

(*Part only shown*)

~~*10.1.2*~~ *10.1.3* A Register or plan ~~of fixed and loose cargo securing fittings, when approved,~~ is to be kept on board and up to date, and is to be made available to the Surveyor upon request. The Register ~~is~~ or plans are to contain sufficient details to enable all ~~the fixed and loose cargo securing~~ fittings to be identified, including:

Existing paragraphs 10.1.3 *and* 10.1.4 *have been renumbered* 10.1.4 *and* 10.1.5*.*

10.2 Periodical Surveys

10.2.1 For the requirements for Periodical Surveys *see* Pt 1, ~~Ch 3,2.2.33~~ Ch 3,2.2.40 and Pt 1, Ch 3,5.3.19.

Part 3, Chapter 16
ShipRight Procedures for the Design, Construction and Lifetime Care of Ships

Effective date 1 July 2010

Section 7
Protective coating in water ballast tanks and double-side skin spaces

~~7.1 Protective Coating in Water Ballast Tanks – Descriptive note PCWBT~~

~~*7.1.1* It is mandatory for all ship types that all salt water spaces having boundaries formed by the hull envelope are to have a corrosion protection coating applied, *see* Ch 2,3.~~

~~*7.1.2* If the Owner so wishes, a descriptive note **PCWBT**, 'Protective Coating in Water Ballast Tanks', will be entered in column 6 of the *Register Book* to indicate that the ship's water ballast tanks are coated with a recognised corrosion control coating and that the coating remains efficient and is maintained in good condition. If the coatings have broken down, particularly at more critical areas, and no effort is being made to maintain the coatings, then this note will be placed in parentheses, i.e. (**PCWBT**). In either case the date of the last survey will be placed in parentheses after the note.~~

~~*7.1.3* Recognised corrosion control coatings are listed in the *List of Paints, Resins, Reinforcements and Associated Materials*, which is published on LR's website, http://www.lr.org, and on the CD-Rom version of the *Rules and Regulations for the Classification of Ships* by LR. Guidance on coating condition is given in Chapter 1 of this List.~~

7.1 Protective coating systems in dedicated sea water ballast tanks and double-side skin spaces – ShipRight Notations ACS(B) or ACS(B,D)

7.1.1 For ships that are required to comply with IMO Resolution MSC.215(82), Performance Standards for Protective Coatings, or IACS Common Structural Rules, all dedicated sea water ballast tanks for all ship types and double-side skin spaces of bulk carriers to have approved coating systems applied according to ShipRight procedure Anti-Corrosion Systems Notations.

7.1.2 **ShipRight ACS(B)** or **ShipRight ACS(B,D)** will be entered in Column 4 of the Register Book to indicate that the ship's sea water ballast tanks or ship's sea water ballast tanks and double-side skin spaces of bulk carriers are coated with approved coating systems according to IMO Resolution MSC.215(82), Performance Standards for Protective Coatings.

7.2 Protective coating systems in dedicated sea water ballast tanks – Descriptive note PCWBT

7.2.1 For ships that are not required to comply with IMO Resolution MSC.215(82), Performance Standards for Protective Coatings, or IACS Common Structural Rules, all sea water ballast spaces having boundaries formed by the hull envelope are to have a corrosion protection coating applied, see ShipRight procedure Protective Coatings in Water Ballast Tanks **(PCWBT)**.

7.2.2 Where requested, a descriptive note **PCWBT** (Protective Coating in Water Ballast Tanks), will be entered in column 6 of the Register Book to indicate that all sea water ballast spaces having boundaries formed by the hull envelope have a corrosion protection coating applied, and that the coating remains efficient and is maintained in good condition. If the coatings have broken down, particularly at more critical areas, and no effort is being made to maintain the coatings, then this note will be placed in parentheses, i.e. **(PCWBT)**. In either case, the date of the last survey will be placed in parentheses after the note.

Part 4, Chapter 1
General Cargo Ships

Effective date 1 July 2010

■ *Section 9* Bulkheads

9.2 Watertight and deep tank bulkheads

Table 1.9.1 Watertight and deep tank bulkhead scantlings (*Part only shown*)

Item and requirement	Watertight bulkheads	Deep tank bulkheads
(1) Plating thickness for plane, symmetrically corrugated and double plate bulkheads	$t = 0{,}004sf\sqrt{h_4k}$ mm but not less than 5,5 mm	$t = 0{,}004sf\sqrt{\dfrac{\rho h_4 k}{1{,}025}} + K_1$ mm but not less than 6,5 mm, where $L <$ 90 m nor less than 7,5 mm, where $L \geq$ 90 m
	In the case of symmetrical corrugations, s is to be taken as b or c in Fig. 3.3.1 in Pt 3, Ch 3, whichever is the greater	
(2) Modulus of rolled and built stiffeners, swedges, double plate bulkheads and symmetrical corrugations	$Z = \dfrac{skh_4 l_e^2}{71\gamma(\omega_1 + \omega_2 + 2)}$ cm^3	$\cancel{Z = \dfrac{\rho skh_4 l_e^2}{22\gamma(\omega_1 + \omega_2 + 2)} \text{cm}^3}$ $Z = \dfrac{\rho skh_4 l_e^2}{22\gamma 1{,}025(\omega_1 + \omega_2 + 2)}$ cm^3
	In the case of symmetrical corrugations, s is to be taken as p, *see also* Note 2	

Part 4, Chapter 2
Ferries, Roll on-Roll off Ships and Passenger Ships

Effective date 1 July 2010

■ *Section 1* General

1.3 Class notations

1.3.1 In general, ships complying with the requirements of this Chapter will be eligible to be classed:

‘**100A1 passenger ferry**’, or
‘**100A1 passenger/vehicle ferry**’, or
‘**100A1 roll on-roll off cargo ship**’, or
‘**100A1 roll on-roll off passenger ship**’, or
‘**100A1 vehicle carrier**’, or
‘**100A1 passenger ship**’, or
‘**100A1 sailing passenger ship**’.

Cross-References

Section numbering in brackets reflects any Section renumbering necessitated by any of the Notices that update the current version of the Rules for Ships.

Part 3, Chapter 1

5.2.2	*Reference* 5.3.8 *now reads* 5.3.10.

Part 3, Chapter 10

Table 10.2.5	*Reference* 2.2.8 *now reads* 2.2.10.

Part 3, Chapter 13

2.8.3	*Reference* 2.9.7 *now reads* 2.9.6.

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